CQ-TV MAGAZINE No. 141

BRITISH AMATEUR TELEVISION CLUB

FEBRUARY 1988

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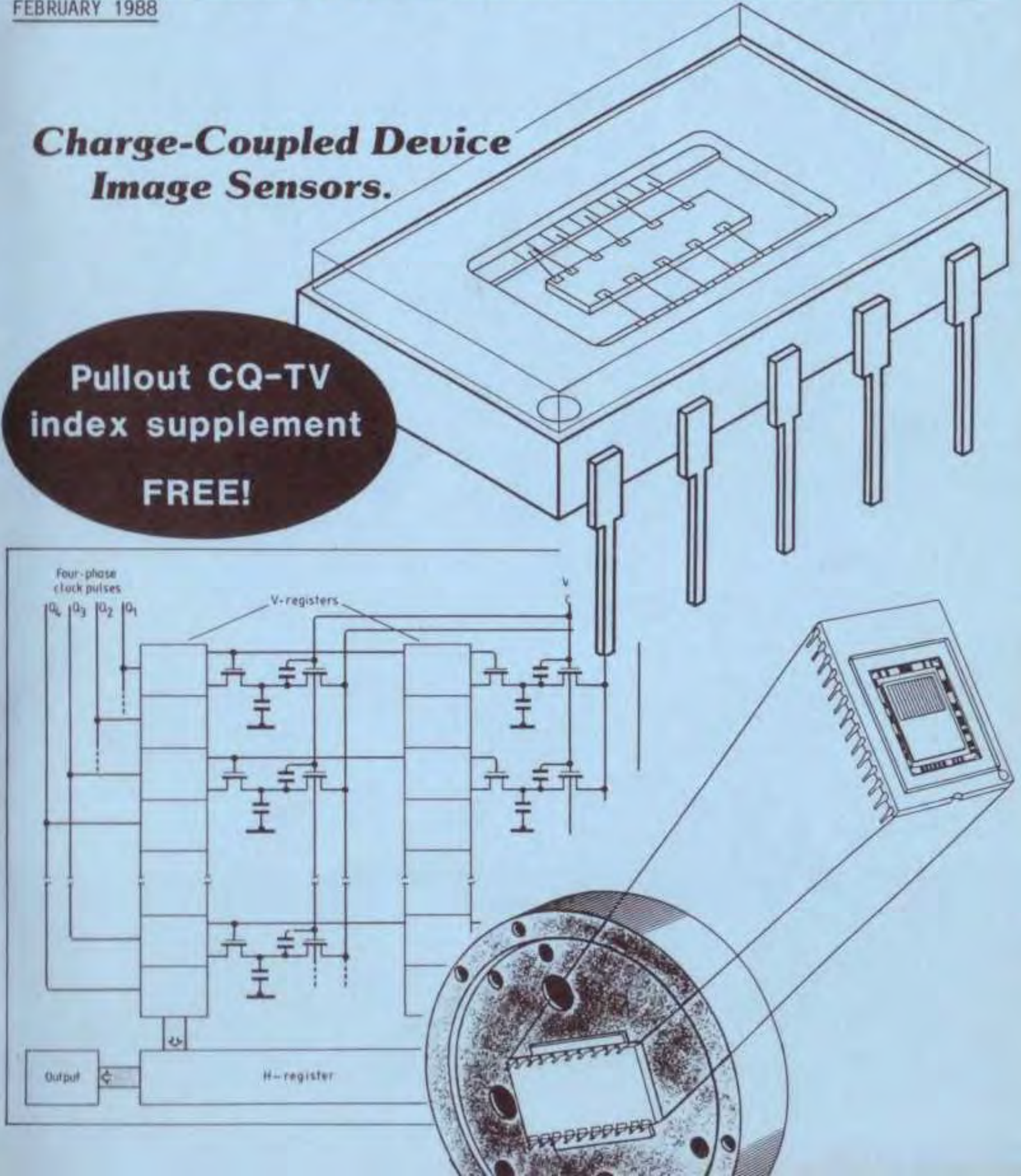

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MEMBERSHIP

FULL YEAR: £6 or £1.50 for each remaining quarter of the year. All subscriptions fall due on the first of January. Membership application forms are available by sending a stamped addressed envelope to Dave Lawton, whose address may be found on page-2 of this magazine.

OVERSEAS MEMBERS are asked to send cheques bearing the name of the banker's London agent. Postage stamps are not acceptable as payment. Overseas airmail is extra - please enquire from Dave Lawton or see the rates list with your last subscription reminder form.

The British Amateur Television Club is affiliated to the Radio Society of Great Britain and has representatives on the committee of the European Amateur Television Working Group.

The BATC is registered under the DATA PROTECTION ACT - all queries to Dave Lawton - and VAT registered - number 468 3863 01.

CQ-TV is produced by the British Amateur Television Club as its official journal and is sent free to all members. It is not for general sale.

The BATC maintains many pages of news and information associated with amateur television on the Prestel Information Service. Club pages may be found within the ClubSpot section and full details were last published in CQ-TV 134. Copies of the article (two pages) may be obtained from the Publications department.

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CLOSE FOR PRESS DATE FOR THE MAY 1988 ISSUE...........20th MARCH

NEED ANY HELP?

Members of the BATC committee are available to help and advise club members on any ATV related subject. Remember that all such work is done in their spare time so please try to keep such queries to a minimum.

GENERAL CORRESPONDENCE - Club affairs; video tape library; technical queries, especially related to handbook projects: TREVOR BROWN G8CJS, 14 Stairfoot Close, Adel, Leeds LS16 8JR. Tel: (0532) 670115

MEMBERS SERVICES - PCB's; components; camera tubes; accessories etc. (other than publications); queries related to such supplies: PETER DELANEY G8KZG, 6 East View Close, Wargrave, Berkshire RG10 8BJ. Tel: (07352) 23121

MEMBERSHIP - Anything to do with membership including new applications; queries and information about new and existing membership; change of address; non-receipt of CQ-TV; subscriptions; membership records; data protection; Prestel: DAVE LAWTON GOANO, 'Grenehurst', Pinewood Road, High Wycombe, Bucks HP12 4DD: Tel: (0494) 28899

LIBRARY - Any queries relating to the borrowing or donation of written material to the BATC central library. PAUL MARSHALL G8MJW, Fern House, Church Road, Harby, Nottinghamshire NG23 7ED: Tel: (0522) 703348

PUBLICATIONS - Anything related to the supply of BATC publications. CQ-TV back issues and other publications are normally only available if listed on the Publications order form with this issue: IAN PAWSON G8IQU, 14 Lilac Avenue, Leicester LE5 1FN. Tel: (0533) 769425

EXHIBITIONS AND RALLIES - also arrangements and information about lectures and talks to clubs; demonstrations etc: SITUATIONS VACANT - any volunteers are asked to contact Trevor Brown.

CLUB LIAISON - and anything of a 'political' nature; co-ordination of ATV repeater licences: GRAHAM SHIRVILLE G3VZV, The Hill Farm, Potsgrove, Milton Keynes, Bucks MK17 9HF. Tel: (0525) 25343

TVI & RADIO INTERFERENCE - problems of this nature to: Les Robotham G8KLH, 38 Ennerdale Avenue, Stanmore, Middx. HA7 2LD. Tel:(01 907) 4219 (not committee).

CQ-TV MAGAZINE - Anything destined for publication in CQ-TV magazine or forthcoming BATC publications. Articles; review items; advertisements; other material; queries on the content of past issues. EDITOR: JOHN WOOD G3YQC, 47 Crick Road, Hillmorton, Rugby CV21 4DU. Tel: (0788) 69447

CONTESTS & AWARDS, CQ-TV ASSISTANT EDITOR - Mike Wooding G6IQM, 5 Ware Orchard, Barby, Nr. Rugby CV23 8UF Tel: (0788) 890365.

Where possible it is better to telephone your query rather than write. Please do not call at unsocial hours. As a guide, try to call between 6.30 and 9.30pm evenings and not before 11am at weekends.

EDITORS POSTBAG

Dear BATC,

I have been given your name and address by a local amateur radio enthusiast and would be grateful if you could possibly give me some information regarding the British Amateur TV Club.

I have been asked to re-start a local cable TV programme by enthusiastic members of the community and I am looking for volunteers and extra equipment to purchase, or exchange, for this purpose. If any BATC members are interested I would be very pleased to hear from them.

Peter Snell, Peter J Snell enterprises, Amp house, 2A Grove Road, Strood, Kent ME2 4BX. Tel: (0634) 723838

Dear Ed,

I would like to thank the Club for its excellent CQ-TV magazine and other publications that I have received.

Would it be possible for you to publish my name and address with an invitation to any ATV enthusiasts in my area to contact me with a view to broaden my knowledge of ATV?

I am currently taking myself on Radio Amateur courses throughout 1987 with a view to taking the summer 1988 examination.

Paul Parkin, 2 The Knoll, Dronfield, Derbyshire S18 6EH.

Dear Ed,

I would be grateful if you would publish this letter asking members in the Portsmouth area to get in touch with me.

Mr. Viv Gregson, Reflections Video, 64 Lower Derby Road, Stamshaw, Portsmouth PO2 8EX. Tel: Portsmouth 673559.

Dear Ed,

I find your articles very interesting and especially those about satellite reception. I have installed a satellite system and I receive very well RTL which is a East Spot of ECS-1 Worlnet for ECS-2 as well as some weaker signals from other satellites.

From ECS-2 I also receive Eurovision but with no sound. A sound-in-sync decoder is obviously needed which is very expensive, so I wonder if any of your members can advise or offer a module which can take the sound from Eurovision channels.

Marios E. Colocassides, 79D Dhigenis Akritas Avenue, P.O.Box 2139, Nicosia, Cyprus.

Dear Ed,

The GB3VA repeater group is looking for interested parties to assist and support a proposed ATV repeater, on or near the existing GB3VA site, which would serve parts of Buckinghamshire and Oxfordshire. The exact service area would be determined later. Timing: about two years from now and an annual fee of around £4.

If any members are interested please write to the address below.

F.A.Jefferies G8PZ

The Secretary,
Aylesbury Vale Repeater Group,
Hunters Moon,
Buckingham Road,
Hardwick,
Aylesbury HP22 4EF

Dear Ed,

Seeing the recent overseas repeater list in CQ-TV I would like to inform you about the latest Dutch ATV repeater; PI6ATV.

The repeater is located in Hilversum at JO22OF. Its input is on 2359MHz FM and the output is on 1285MHz FM. Power output is 13-Watts.

Both receive and transmit aerials are Alford slots which are mounted about 40-metres above sea level. The repeater is provided with a beacon mode, manually controlled via 2-metres. The transmitter sends a colour test pattern and repeater information for about four minutes after a 1750Hz tone has been received on 144.750MHz. However, the 13cm receiver - which checks for syncs on its input - has the highest priority. If an incoming signal disappears, the repeater will switch into beacon mode.

During normal conditions P4 - P5 reports have been received from stations about 30km away. During lift conditions P4 - P5 reports have been received from stations in Germany over distances of 155km or more.

To get some activity for the repeater a 13cm transmitter has been designed by PE1CKK. The video modulated oscillator runs at half the final frequency and a final output power of around 50mW is available at the output.

Thanks to everyone who helped to get the repeater operational.

PE1CKK, PA3CWS, PA3CKX

NEWS ROUNDUP

MEMBERSHIP FORMS

The 1988 information leaflet and membership application forms are now available. Their colour is white and the form has been somewhat updated. Those of you still posessing the 1987 (green) forms (or earlier) are asked please to destroy them.

The new forms are available from the Membership Secretary.

NEW PC BOARDS AVAILABLE NOW

A pair of boards are available for the A/V fader design in CQ-TV 140. Please note that there are one or two errors on the present stock, all are easily rectified and full details are being sent out with each board. However, if you have already purchased boards and do not have these details then they may be found under 'In Retrospect' in this issue.

A board for the audio subcarrier generator detailed in CQ-TV 139 (p.53) is also available. Component layouts and any other appropriate information is included with the boards. Orders should be made on the Members Services form in the supplement supplied with CQ-TV magazine.

VIDEO SIGNALS IN AN OPTICAL WAVEGUIDE

The January 1988 issue of 'Elektor Electronics' carries a description of a new optical waveguide transmission system for video signals.

Up till now analogue video signals have had to be transmitted over comparitively short distances to the monitors via coaxial cables. 'Optical cables however offer the advantage of practically unlimited immunity to interference from stray electromagnetic radiation, and high security against interception...Siemens has now developed a video transmitter module for optical waveguides that provides a low-cost means of realizing video transmission systems.

The maximum transmission distance is 2km when using 50um graded-index fibre with a maximum route attenuation of 9dB. The optical transmission uses a frequency modulation method. In order to increase the range, repeaters can be set up with digital optical modules. Thus, without appreciable loss of quality a distance of up to 8km can be covered. The supply voltage is 5v. The signal bandwidth of typically 7MHz and the output voltage of 1v p-p into 75-Ohms permits connection of a colour monitor.

Siemens AG. Postfach 103, D-8000 MUNCHEN 1, West Germany.

MEMBERS SERVICES

Please note that only the items listed in the CURRENT "Services for Members" leaflet are available - a description of the various pcb's and components can be found in CQ-TV 140 onwards. If you require a special 'C' mount, such as for a lens turret, please write to Members Services with a drawing of your requirements. Batches of callsign badges are sent to the engravers once per magazine cycle. Please ensure that your order reaches BATC Members Services by the CQ-TV close-for-press date, given in each issue. Badges are distributed to members as soon as they have been engraved.

Some new boards are in preparation, and will be announced on the BATC Prestel pages, if you can't wait for the next CQ-TV.

BATC Members Services DOES NOT hold stocks of BATC publications, and vice versa. Please send your order to the APPROPRIATE ADDRESS, as otherwise extra delay and expense is caused in fulfilling the order.

SUBSCRIPTION RENEWALS

You should all by now have received a subscription renewal form. I hope you have completed and returned it, however, if it has slipped your mind, then I urge you to rectify the matter without further delay, otherwise you will receive no more copies of CQ-TV and will be removed from the membership files.

In case you have mislaid your form, or the dog's chewed it up, then all you need do is jot your name, address and callsign (if applicable) on a piece of paper. Mark it '1988 subscription renewal' and send it, not forgetting to enclose £6 plus any additional postage if you are overseas, to: Membership Secretary, 'Grenehurst', Pinewood Road, High Wycombe, Bucks HP12 4DD, England. Cheques should be made payable to 'BATC'.

VAT AND THE BATC

Due to the club's continuing success and the increasing turnover, it has become necessary to register for Value Added Tax. Our VAT registration number is: 468 3683 01. In order to restrict as far as possible the volume of administrative paperwork, a VAT receipt will not normally be issued for club transactions, however a receipt will be given upon request at the time of the transaction.

Despite VAT the committee has decided to leave the 1988 subscription unchanged at £6. Publications are exempt from VAT and therefore remain the same price, but postage is not exempt so those prices have been adjusted. Printed circuit boards, hardware - in fact everything obtained from Member's Services - must have the current rate VAT added to both the goods price and postage. This applies to all goods sold 'over the counter' or despatched by mail order to U.K. addresses. Overseas members do not need to add VAT to their order total provided the goods are sent to an overseas address.

Any member who needs more information or clarification on this subject is asked to write to the Hon. Treasurer - Brian Summers, G8GQS - at; 29 Perivale Grange, Perivale Lane, Greenford, Middlesex UB6 8TN.

1988 BATC RALLY

The 1988 BATC rally will take place on Sunday April 24th at the Post House Hotel, Crick, Nr.Rugby. Further details may be found elsewhere in this issue.

SPECMANSHIP

Part-4 MODULATION

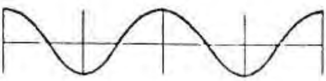
By Mike wooding G6IQM,

Modulation is the means whereby the required information, be it voice, video or data, is 'added' to the carrier in order that it may be transmitted: in our case via the air-waves. There are several different types of modulation but the two main ones used by amateurs are Amplitude Modulation (AM) and Frequency Modulation (FM).

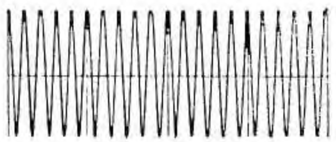
AMPLITUDE MODULATION

This is the mode used by ATV stations on 70cm and is, incidentally, the simplest to achieve. AM is produced by varying the amplitude of the carrier waveform in direct relation to the amplitude of the modulating signal (ie. base-band video etc.).

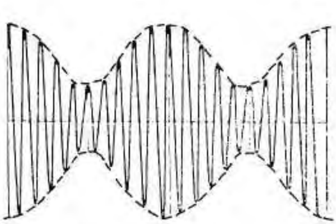
Fig.1a shows a constant amplitude sinusoidal carrier waveform and in Fig.1b there is a sinusoidal base band signal to be modulated onto the carrier. The resultant modulated wave is shown in Fig.1c, the dotted outline of which is known as the Modulation Envelope, which is an exact copy of the base band signal. If, as is more usual, the modulating waveform is not a single frequency but made up of many frequencies - such as a video waveform - then each frequency would produce a modulated wave. The resultant envelope being a mirror-image of the modulating waveform superimposed onto the carrier.



1A: MODULATING WAVE



1B: CARRIER WAVE



1C: MODULATED WAVE

Fig.1 Amplitude modulated waveform

Without going into some pretty heavy maths you may have to accept this next part at face value (remember the blind faith?). When a carrier fc is modulated with another frequency fm, the resultant waveform will contain components at three different frequencies: fc, fc+fm and fc-fm. When the modulating signal is a complex one (such as video) then the secondary components fc+fm and fc-fm are produced for each individual frequency in the modulating waveform. The spectrum thus produced contains a band of frequencies either side of the carrier, and it is these bands of frequencies which actually contain the wanted information. The band of frequencies fc-fm below the carrier is called the Lower Sideband and the band fc+fm above is called the Upper Sideband (Fig.2)

In ATV work we generally use the entire spectrum produced from the modulation process for transmission. This is known as Double Sideband transmission with full carrier. However, it may be of interest to note some of the other methods of AM in use;

Probably the second most well-known version of AM is the Single SideBand mode (SSB). (Ideally it should be known as the Single Sideband Supressed Carrier mode). In this mode the whole spectrum is produced as normal, but before the modulation envelope is presented to the PA stages the carrier and the unwanted sideband is filtered out. The resultant signal is then amplified and transmitted. The advantages of using this method are reduced bandwidth occupied by the transmitted signal and improved signal-to-noise ratio at the output of the system. Also, due to the lack of carrier presented to the output stages, power is only produced when the modulating signal occurs, thus improving the efficiency and reducing the duty cycle of the PA. The main disadvantage of SSB is that the carrier needs to be regenerated and reinserted into the signal in the receiver before de-modulation can take place. This regenerated carrier must of course be at exactly the same frequency as the carrier at the transmitter.

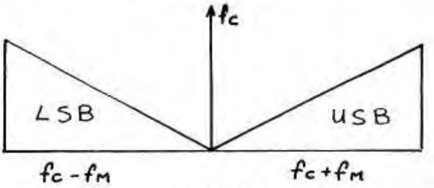


Fig.2 AM Sidebands

Another mode of AM that we come across in amateur work - and in particular in ATV working - is the Vestigial SideBand mode. Once again the full spectrum is produced as before, but then passed through a high-pass filter network, which removes most of the lower sideband. The resultant signal transmitted contains a small proportion of the lower sideband, the carrier, and the whole of the upper sideband (Fig.3). The main advantage of this mode, and the one that is particularly attributable to ATV on 70cm, is the considerably reduced bandwidth of the transmitted spectrum. (This also means an improvement in the output power of the transmitter).

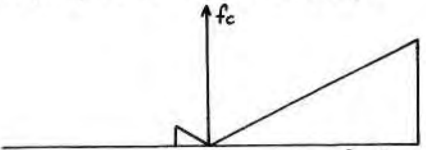


Fig.3 Vestigial sideband spectrum

To put this narrowing of the bandwidth of the transmitted signal into perspective; a composite colour television video signal is in the order of 5.5Mhz wide (ignoring any sound carrier which ought not be present on 70cm anyway). Once this signal has been modulated onto our carrier the spectrum will be something in the order of 11MHz wide (ie: fc-5.5 to fc+5.5). Taking 70cm as our band in question, with our carrier say at 435Mhz, it doesn't take much maths to work out that we would be out of band at the high end and causing considerable interference to other band users and repeaters at the low end. The situation would be far worse if we were using intercarrier sound at 6Mhz! Hence you can see the reason for our constant reminders that it is not advisable to use colour transmissions on 70cm and to reduce the maximum baseband frequency to 3MHz. For one you may be breaking your licence conditions by radiating out of band, and two you may be causing severe interference to other band users. Vestigial SideBand could be a saving grace, by lowering your carrier to-say-434Mhz, then the highest frequency radiated should not exceed 439.5Mhz, and the lowest 432.75Mhz.

Whilst discussing vestigial sideband it may be of interest finally to take a look at the spectrum of a standard U.K. broadcast TV signal. The diagram in Fig.4 shows the spectrum, and as can be seen the overall bandwidth, including the sound subcarrier, is 8Mhz. The lower filtered sideband is 1.25Mhz wide at full amplitude, falling to zero very sharply. The chrominance signal is

superimposed upon the luminance signal by making the chrominance modulate a 4.433Mhz subcarrier, and then using a system known as Quadrature Amplitude Modulation, whereby the two signals (luminance and chrominance) modulate the same carrier, but with a 90 degree phase shift between them, (got that? - right.....). The two sets of sidebands within the upper sideband spectrum do not become intermixed during transmission, and are demodulated in the receiver by using two oscillators also 90 degrees out-of-phase. Finally, a point not often realised is that the sound 'subcarrier' within the broadcast TV spectrum is not really a subcarrier at all, but is in fact transmitted as a separate carrier 6Mhz above the vision carrier. Also, the audio is frequency modulated onto this carrier.

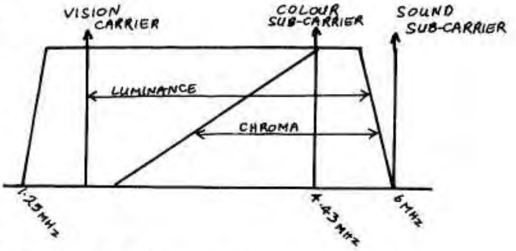


Fig.4 Broadcast TV spectrum

This ends our look at amplitude modulation. I realise that I have only brushed the surface of a complex subject, but I hope that it serves to help some of you to understand it a little better. Now to something that may really stretch the blind faith to extremes!

FREQUENCY MODULATION

Frequency Modulation is the mode used by most of us for speech communication, by broadcast VHF radio and by most of the modern PMR systems. This technique is achieved by varying the frequency of the carrier in direct relation to the amplitude of the modulating signal. The main advantages of FM over AM are:

1) FM has much better noise rejection than an AM signal. This is because the required information is carried in the frequency of the carrier, and interference from outside sources generally causes amplitude variations in the carrier.

2) Owing to the fact that the power contained in a sine wave is proportional to the square of its amplitude, it can be seen that amplitude modulation of that sine wave will reduce the power contained in it. Frequency modulating the sine wave, however, does not cause its amplitude to vary, thus the maximum power can be transmitted.

To benefit from these advantages when using FM, a much wider bandwidth must be used than with AM. If the bandwidth is restricted to that of a double-sideband AM transmission (as is used in the NBFM mode), then it is very difficult to tell the two apart. The mechanics of frequency modulation are not easy to explain, and I must admit to referring to my old college notes again for revision.

When a sinusoidal waveform (the carrier) is frequency modulated, its frequency at any instantaneous point in time is varying in harmony with the modulating waveform. That is, the variation of the carrier frequency occurs at a rate equal to the frequency of the modulating signal. The amount by which the carrier frequency varies is dependant on the amplitude of the modulating

signal. Thus, the greater the amplitude of the modulating signal, the greater the frequency shift of the carrier.

Thus summarising:

> The rate of frequency shift of the carrier about its centre is determined by the FREQUENCY of the modulating signal.
>
> The amount by which the carrier shifts its frequency is determined by the AMPLITUDE of the modulating signal.

The diagram in Fig.5 shows the resultant waveform after a carrier has been frequency modulated with a single frequency source.

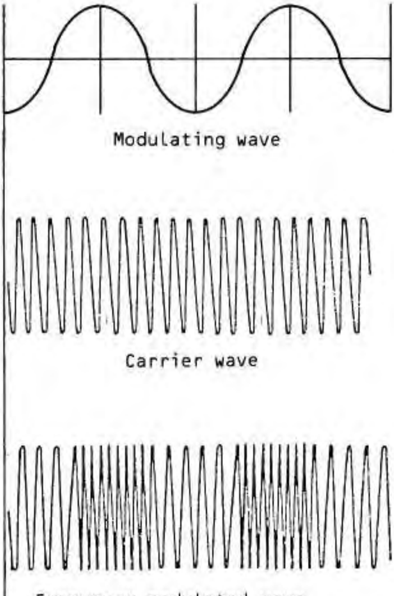


Fig. Frequency modulation

The amplitude dependant frequency shift of the carrier is a very important factor of the modulation process, and is known as the FREQUENCY DEVIATION, (a term you will come to know and love as you investigate the vagaries of 24cm TV). Unlike AM, where the maximum depth of modulation is limited by the voltage swing of the carrier, in FM the limiting factor is the bandwidth of the modulating and following amplifying stages and the restrictions imposed by the licensing authorities. Thus it can be seen that very large depths of modulation (deviation) can be achieved with FM, giving a much superior resultant base-band signal-to-noise ratio at the receiver output, as can be heard on VHF broadcast radio and seen on 24cm FM TV.

Another major difference in the resultant spectrum produced after modulation, is that with AM only two sidebands are produced, however, on FM an infinite number of sidebands are produced. Fig.6 shows some of the sidebands produced when a carrier is frequency modulated with a single frequency source. Many more sidebands may be produced, but only the first six have been shown. From the diagram it can also be seen that the amplitudes of the various side-frequencies also varies. These levels are dependant on the amount of deviation being applied to the carrier, and at certain levels of deviation the carrier itself may be totally suppressed! Therefore, we must pay particular attention to the amount of deviation being applied to the carrier, too much will produce sidebands that cause interference with other users or radiate out-of-band, too little will result in poor pictures at the receiving station. Accurate filtering is therefore also essential when using FM transmissions.

Unlike AM, because the modulation process varies the frequency of the carrier and not its amplitude, the total power contained in the spectrum remains constant and equal to the level of the unmodulated carrier. Thus, on a power basis frequency modulation far outweighs amplitude modulation.

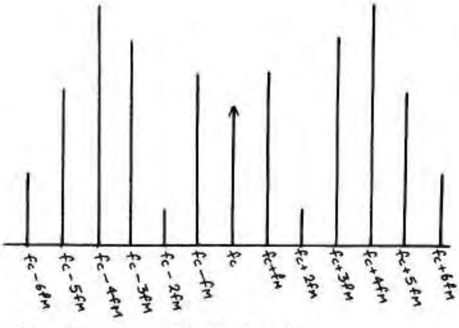


Fig.6 FM sidebands

Finally, in Fig.7 I have shown extremely simplified circuits for AM and FM modulators, showing the basic differences. In the AM version, the modulating signal is used to control the voltage supply to the carrier amplifying stage, thus producing a carrier at the output whose amplitude varies with the modulating signal. The voltage swing of the modulating signal must be carefully controlled and the amplifying stages must be as linear as possible, in order to achieve as distortion-free a spectrum as possible.

In the FM version, the modulating signal is applied to a varactor diode in the reactive stage of the carrier generating oscillator. The varying frequency of the modulating signal across the diode causes its capacitance to vary, and thus the frequency of the oscillator will vary about its centre in direct relationship to the frequency of the modulating signal. The maximum swing of the oscillator frequency must be evaluated, and the amplitude of the modulating signal controlled, in order to maintain the deviation within those limits and thus produce a distortion free spectrum.

That's it then! I hope that some of it made sense to you and that it may be of some use in helping you to understand the very basic mechanics of the two systems.

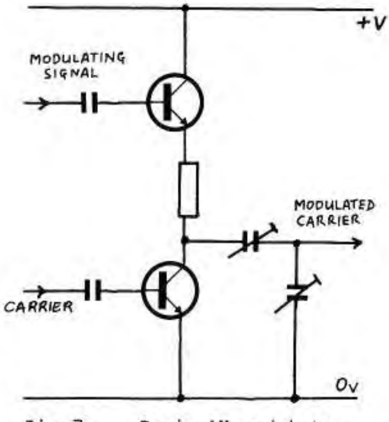


Fig.7a Basic AM modulator

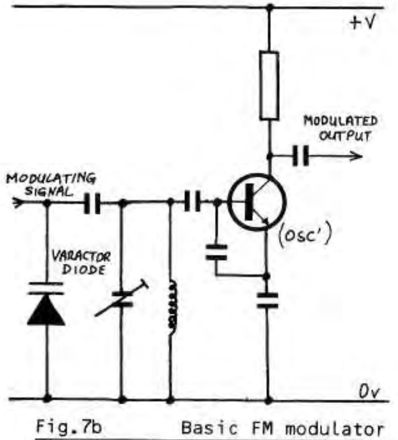


Fig.7b Basic FM modulator

ATV WORKING - 10.25GHZ

SOFTWARE NOTEBOOK

No.12

By Robin Stephens G8XEU

The program below is for the Spectrum computer. It is a MAIDENHEAD locator program with a bearing indication given from the source locator. Also it calculates the points scored in a BATC TV contest.

It must be remembered that as with all locator programs of this type, it is not 100% accurate. This is because all calculations are worked out from the centre of the locator square. Therefore bearing calculations are not quite right and distances given between stations may not be quite correct, unless of course both stations happen to be in the centre of their locators. For Amateur purposes however it is accurate enough to be regarded as 100% true.

Line 240 multiplies the distance in Kms by 2, to give the QSO score, change the figure 2 in that line for other multiplication factors.

```
 10 REM MAIDENHEAD LOCATOR BY R.STEPHENS G8XEU
 20 CLS : POKE 23658,8
 30 LET C$="ENTER SITE LOCATOR:- ": GO SUB 70
 40 GO SUB 140: LET A=C: LET B=D: LET B$=A$
 50 LET C$="ENTER LOCATOR ": GO SUB 70
 60 CLS : GO SUB 140: GO SUB 170: GO TO 50
 70 INPUT (C$); LINE A$
 80 IF LEN A$<>6 THEN GO TO 130
 90 FOR J=1 TO 5 STEP 2
100 LET E$="AR09AX"(J TO J+1): FOR K=0 TO 1
110 IF A$(J+K)<E$(1) OR A$(J+K)>E$(2)
    THEN GO TO 130
120 NEXT K: NEXT J: RETURN
130 LET C$=A$+" ERROR TRY AGAIN ": GO TO 70
140 REM MAIDENHEAD TO XY CO-ORDINATES
150 LET C=PI*(-90+(CODE A$(2)-65)*10+(CODE
    A$(4)-48)+(CODE A$(6)-64.5)/24)/180
160 LET D=PI*(-180+(CODE A$-65)*20+(CODE A$
    (3)-48)*2+(CODE A$(5)-64.5)/12)/180: RETURN
170 REM CALCULATE & PRINT RESULT
180 LET F=D-B: LET E=180*(A-C>0)
190 LET G=SIN A*SIN C+COS A*COS C*COS F
200 IF F THEN LET E=90+ATN ((G*SIN A-SIN C)/
    (COS A*COS A*SIN F))*57.29+180*(F<0)
210 LET H=INT (6370.144766*ACS G+.5)
220 PRINT B$;" TO ";A$;" = ";H;" KMS"
230 PRINT "BEARING= ";INT (E+.5)
240 PRINT "POINTS= ";H*2: RETURN
300 SAVE "MAID QRA" LINE 1
```

A NEW '1043

By Peter Delaney G8KZG

We all know the Mullard '1043 - it's one of those tinplate boxes that tunes the UHF television band - aerial in, tuning volts 0 - 30V, if out, and about 0.6V tunes 70cm. So, as it's "old hat", why an article in CQ-TV?

The answer is that the tuner is an ELC1043 - this article is about the SAA1043. Again made by Mullard, this looks like being equally useful, as it is a "Universal Sync Generator". It produces line drive, field drive, mixed sync, mixed blanking, burst gate and PAL switch, amongst other things. By selecting 3 inputs (5, 6, 7) either high or low, PAL, SECAM, NTSC PAL-M signals can be produced, and also a 624 or 524 line standard for video games, omitting the half line in each field. For 625 line variants a 5MHz crystal can be used, whilst a 5.034964MHz crystal is needed for 525 line variants.

Alternative modes enable a crystal of half the frequency above to be used, or an LC pi-filter. The IC also includes the circuitry to lock the SPG to an external sync source, which does not need to be to broadcast standard - in fact it will lock to a VCR, although for this mode, the LC oscillator circuit is preferred to the crystal one. The circuit works from a single power rail of about 6V (5.7 min and 7.5 max). The output pulses are at CMOS levels, so, of course, need buffering to drive a 75-ohm line.

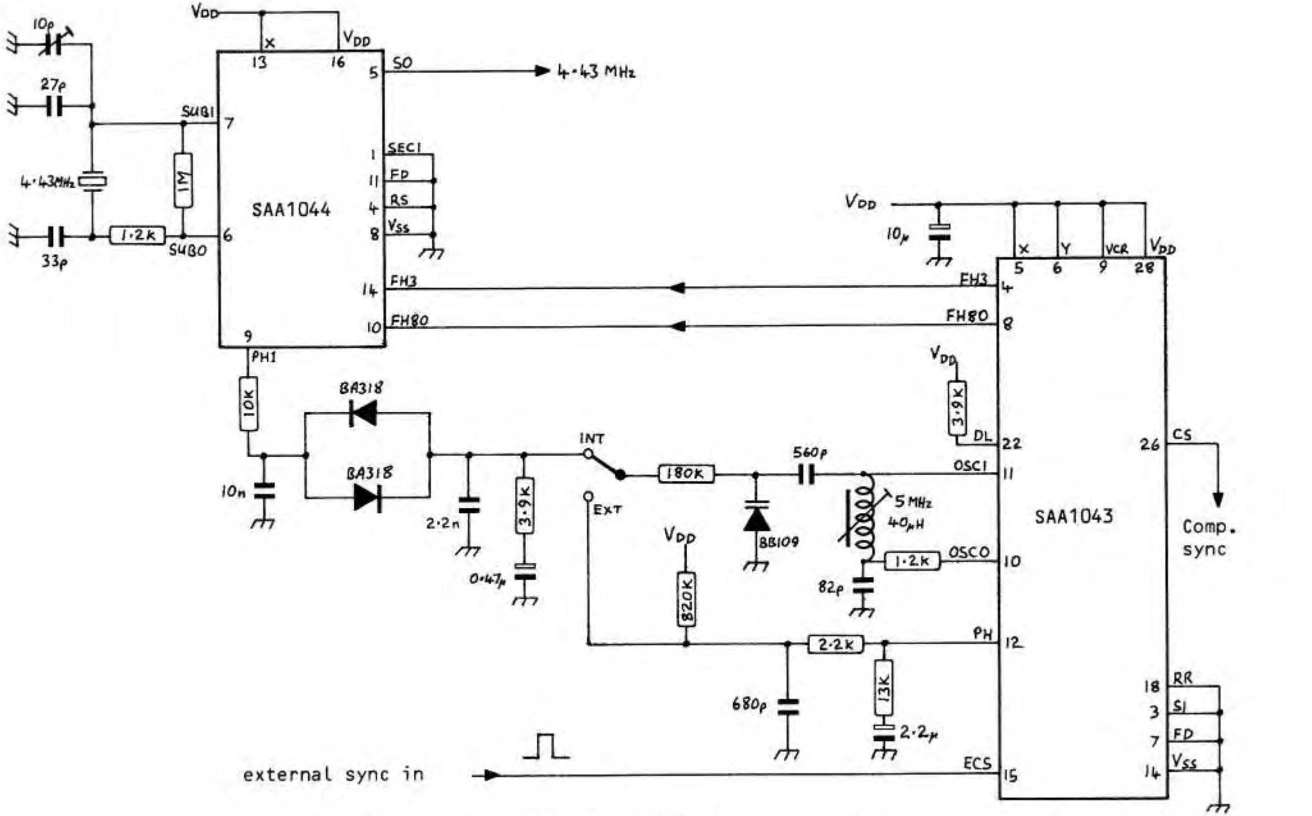
Standard	Pin5	Pin6	Pin7
PAL/CCIR	1	1	0
SECAM 1	0	0	0
SECAM 2	0	1	0
NTSC 1	0	0	1
NTSC 2	0	1	1
PAL-M	1	1	1
624 line	1	0	0
524 line	1	0	1

Standard selection pin connections.

There is a companion IC, the SAA1044, to enable subcarrier lock to be obtained. The device is called a "Subcarrier coupler" and produces several signals to control the SAA1043, so that the colour subcarrier and line frequencies are locked together. By selecting 3 inputs (11, 13, 14) either high or low, PAL, SECAM, NTSC, PAL-N or PAL-M relationships can be achieved.

Standard	Pin11	Pin13	Pin14
PAL/CCIR	0	1	400Hz
SECAM	0	0	Don't care
NTSC	1	0	0
PAL-M	1	0	1
PAL-N	1	1	400Hz

The SAA1043 and SAA1044 are available in small quantities from Unitel Ltd, Unitel House, Fishers Green Road, Stevenage, Herts, SG1 2PT - at the time of writing, the cost is around £7 each, inc VAT, plus carriage and packing.



SYNC GENERATOR AND PAL COLOUR LOCK APPLICATION DIAGRAM.
(Mullard Technical Handbook - Book 4, part 2a)

For those to whom the ELC1043 is not familiar, pages 12 - 14 in Amateur Television Handbook (blue cover) detail the connections and possible modifications for amateur use. The book is now out of print, but photocopies of the article can be obtained from BATC Publications in the usual way. The tuner is available from several advertisers in 'Television' magazine.

The diagram shows the SPG circuit together with the companion subcarrier coupler, so that you can see what the final circuit should look like. No doubt, there will soon be some multi-standard SPGs in the ATV shack.

EDITOR'S NOTE - It is hoped to publish a design in CQ-TV, based on the above devices, in the not-too-distant future.

Notes on the SOLENT (Worthing) 24cm ATV TRANSMITTER

The Solent Scientific 24cm FM-ATV transmitter - now marketed by the Worthing Video Repeater Group - has proved very popular over the last two or three years. Of course with such a relatively complex kit, coupled with the high frequencies used, there are bound to be some constructors who experience difficulties. I am happy to say that the Worthing Group offer a full service backup on all transmitters so no-one should be left dissatisfied.

Having said that, there are one or two points which may be of some use to users who feel perhaps they might not be getting quite the performance that they should from their transmitter:

Probably the most common cause of a wide range of faults (instability, poor RF output, parasitics etc) is that the board is often not fitted into the recommended or other suitable metal box. The original (Solent) kits weren't supplied with a box although the Worthing ones are. It is important to ensure a good fit for the board inside the box with multiple earthing points around it. The correct diecast box is Eddystone number 10758PSL which is available from STC Electronic Services (amongst others).

Another tip to improve frequency stability is to fit a small value capacitor, say 10 or 15pF, from the junction of L2/R4 to ground (use the shortest leads possible).

There are several other modifications which have been incorporated into the Worthing kits and the original documentation has been re-written accordingly, also with other information etc. Anyone who has one of the original Solent kits and who would like a copy of the latest documentation is invited to send £1 to the Worthing Group (see adverts in CQ-TV) to cover copying and postage.

There is now a frequency-lock module available for this transmitter. Further details in the Worthing Group's ad. or direct from them.

TV ON THE AIR

By Andy Emmerson G8PTH

The time has come once for for our three-monthly round-up of your activity on the air, so I shall dip into the mailbag and fish out a few letters (actually it's a letter tray but mailbag sounds better!)

Down to business, and the first letter is from Jean G0AWX in Bishopsworth, Bristol.

"PLEASE DO NOT START A LADIES PAGE ...", she starts in block capitals. "That is the plea from two ATVers in Bristol. If I say one is Viv G1IXE and the other myself, I feel sure you will listen, won't you?!!! You see, we wish it to be known that at least two lady members rather enjoy being one of the 'boys'... simply because the real 'boys' always spoil us dreadfully anyway, and we do understand one or two details about our branch of the hobby. Ha! This is meant as fun, hope it made you smile. And just to flatter you I want you to know I truly enjoy your page, thank you."

Wow, what can I say after that? Nothing, except very many thanks. I know if I try and cap it with some clever-dick comment I shall probably regret it ever after! So, quick onto the next letter ...

FOREIGN NEWS

It comes from Stanislav Pazur, our regular correspondent from Warsaw, who informs us that the Polish ATV club, the Radiovideograph PRV Club held its third annual meeting during May in Slupsk. "They are interested in SSTV, MSTV, FSTV, ATV, Fax and Data. There are 48 radio amateurs and three club stations in the club. Leading lights among them include;

SP2JPG - SSTV contacts confirmed with 49 countries
SP3LPM - with 23 countries
SP3CMX - with 11 countries (also 54 on RTTY)."

More snippets of foreign news: Michael ZL1AB hails from Auckland, New Zealand and has been doing a lot of home construction projects. Some of the parts he uses are unavailable in New Zealand and he has to obtain them by mail order from England. He writes: "Bonex Ltd have been marvellous with components not available in ZL. They even sent a free catalogue last time." I must admit the BATC sometimes receives letters of hate from ATVers who have been 'ripped off' by mail order traders, but comments about Bonex of Acton are always favourable. They hold a wide range of electronic components, including the Toko inductors and chokes, and sell them at reasonable prices. They are seldom out of stock, either, unlike another Toko distributor.

Michael continues: "70 cm is still the prime band for ATV here in ZL. So much 70cm equipment is being built, though it usually provides for sound and colour too. Not having specialist ATV companies, we have to build much of our equipment locally. The Auckland VHF Group is doing ATV-related kits - a preamp, converter and QRP transmitter, which will help. If anybody is ever visiting Auckland and wants to talk ATV, my number is (09) 415 9584. The ATV net is on 443.25 MHz AM TV, with a sound co-ordination frequency of 146.575 MHz FM. Activity is on Sundays 20.45 - 22.30 or later."

BALLOONATIC TV

In the past we have discussed ATV from radio-controlled helicopters and model aircraft, also F3YX's exploits in a hot-air balloon. Now comes word from the States where Bill WB8ELK has put ATV aloft in a helium balloon. Here's the official report ...

After some delays and re-schedules, the WB8ELK helium-filled balloon ATV experiment was finally launched at 13.25 on Saturday 15th August, 1987. Launch was from Findlay, Ohio, and Bill was aided by fellow members of the Findlay ATV group. The radio package comprised a 1-watt ATV transmitter (PC Electronics Kreepie-Peepie), a custom-built computer video graphics generator switching bewteen two colour pictures of a balloon. A GLW morse ident generator also transmitted a 100mW signal on 144.340 MHz FM. Power for the setup came from ten Polaroid lithium cells, which gave 500mA at 12 volts for around seven hours.

The balloon itself was a 5ft weather balloon of the type used by the National Weather Service for radiosondes. It was provided with a parachute for recovery, aluminium foil strapped to it for better observation and radar reflection and of course the VHF/UHF transmitter package. The 2 metre antenna was a quarter-wave vertical whip, while the 439.25 ATV transmit aerial was a horizontally polarised turnstile. The total package weight came in at 2lb 11oz and our final lift weight was 2lb 15oz, giving us only 4oz lifting force and resulting in a slower than planned ascent of approximately 700 to 800 feet per minute.

MAXIMUM ALTITUDE 70,000 FEET

Some accidents were sustained: during the launch the turnstile antenna was damaged as it was dragged through a cornfield during initial takeoff, and this later resulted in deep fades as the antenna spun around. Also the vision transmitter ceased working just before 15.00, at about 60,000 feet. Five minutes later the CW generator left the air at approximately 70,000 feet; one theory is that the lithium batteries may have burst due to the near vacuum at this altitude. The balloon was tracked visually for three hours by Jim WA8VWY in his Cessna: light winds kept it within 18 miles of Findlay during this period. Later it looked like a bright star and disappeared, never to be found again. Bill says that anyone capable of looking through binoculars at a tiny speck in the sky for hours while lying in a ditch filled with poison ivy has to be dedicated! (So was Bill: he put an estimated US $300 to 500 of his own money into the project. About $50 worth of hardware was donated.)

BALLOON DX

Some spectacular results were obtained from this experiment. The highly elevated TV signal was received as far to the east as Buffalo, New York (W2RPO, 290 miles) and to the west towards Chicago (250 miles) by N9AB (P2), and two others (P3 signals). Several other reports were received. Within three minutes of launch the balloon passed through and inversion layer at 25,000 feet, producing reception for a minute in Cleveland, Pittsburgh, Detroit and Canada. The two metre beacon travelled even further, with reports from up to 400 miles distant. All in all, this experiment was a lot of fun and even instructive. Who is going to emulate them over here?

SSTV

Roland G4UKL (Falmouth, Cornwall) passes on some SSTV news from both sides of the Atlantic. "Firstly the IVCA is holding a light-hearted SSTV contest to find the most beautiful girl to be transmitted over the air. Oh dear, will Viv and Jean allow this? Yes, I suppose they will if they lump themselves in with 'the boys'! The rules are simple ... the girl can be your daughter, daughter-in-law, the girl next door, or any pretty girl you know BUT it must not be your wife! Minimum attire is a bikini. The girl may be of any age. Here is the rub ... the entries have to be transmitted or relayed to Steve N9CNT and backed up by a tape or picture. Steve will then make up a composite tape of all entries received and send them to the international net controllers. They will take a vote from net members and the winner will be decided upon from the nets' count. One station, one vote - and only on one net. The rub is the difficulty with present propagation conditions getting a picture across to Steve, but many will try.

"Which leads me onto the next item. There is to be a European net on Saturdays at 1400 UTC, which will link up with the North American net at 1500 UTC. Because no single station could hope to control all Europe, there are going to be two net controllers. Michel DJ0GF will work from Lake Constance and I (Roland G4UKL) will relay from Cornwall. Appropriately I am not very far from Poldhu where the first Marconi trans-Atlantic transmissions were made.

"IVCA will continue to advocate the use of 14.345 +/- 3 kHz as the SSTV frequency spectrum and will, when the time is right, QSY all nets to that frequency, leaving 14.230 as the calling frequency. My own view is that having the SSTV slot right in the middle of the band was a disastrous initial mistake: it should have been tacked onto the RTTY zone around 14.100. To make matters worse, there is a difference of frequency allocation between the IARU areas. In Europe most operators just ignore the present SSTV band plan; you may have heard the comment that 14.230 is the International Tuning-up and CQ calling frequency. I can testify to the validity of this.

"One final word about 14.230. In Cornwall, when there is any sniff of propagation there is a peculiar signal to be heard, varying between S2 and S5. It consists of a peculiar whirring noise with a periodic morse call of UD. It peaks at my QTH from the east and clearly is some form of beacon which I cannot trace. I wondered if this was being heard elsewhere. At its loudest it corrupts SSTV."

Hmm ... a mystery. I'm sure one of our well-read fraternity can solve this. Our final letter is also from Falmouth, from our old friend Johnny Brown G3LPB. He writes: "Re SSTV news, here I am always building gear (mostly from

scrap) and enjoy every moment of it, at present learning the computer side. I had a letter from Grant Dixon, he is a marvellous chap. They were both here a few months back, marvellous to see him so active after his fall. My operating is a bit of SSTV on 20 using the original standards, but these are fast dying. SSTV has become lots of rich people sending pics from their Robots, and even these have been doctored up. Colour SSTV to me is really a waste, even to build and watch. It's a bind to fill three memories and then play back. Again I use an adapted TV for this, but my interest at the moment is in the computer side."

CLOSEDOWN

No other reader contributions and virtually nothing at all on fast-scan. That is strange: I am told last Autumn's lift was a real cracker, but not a single written report has been received here. Does no-one want to claim a record? Anyway, watch out for bright, dry snaps during snowy periods: you can get some excellent tropo DX in mid-winter. Of course, what the weather will be like when you read this is nobody's guess, but the number of berries on the bushes outside makes me think it will be a cold winter!

Let's have those letters then: send them to me at 71 Falcutt Way, Northampton, NN2 8PH.

TERM TROUBLE?

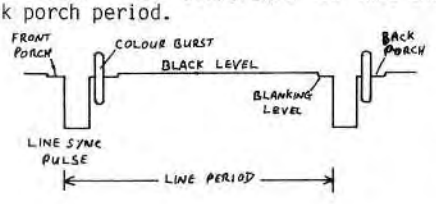
Do YOU have trouble with those technical abreviations and terms which litter the pages of the technical press? Yes, we thought so. OK then, let's have a go at some of them. Of course, even we in the CQ-TV office, brilliant though we are(?), may occasionally be guilty of the odd terminological inexactitude, so we rely on you boffins to keep us on the straight-and-narrow.

Anyone with a pet term which they don't understand is invited to send it to us where we shall try to explain it to you by letter and may also include it in CQ-TV.

This one baffled Pat James - GW1SXU:

'Black source' or 'Black & burst'

A 'black source' is a unit which generates a composite television signal containing sync and blanking information, but no vision. In other words the video level rests at 'black level' permanently - rather like turning the gain down on a camera or leaving the lens cap on. 'Black and burst' is the colour equivalent. The difference is that the colour burst is also present in the back porch period.



A 'Black & Burst' waveform. A 'Black Source' produces a similar waveform but without the colour burst. Note that black level and blanking level are often - but not always - the same value.

A 10G ATV STATION

By R.Platts G8OZP

With the increase of interest in 3cm amateur TV shown by recent articles in CQ-TV, I decided to put pen to paper and describe my own home-brew system. The complete transceiver was originally built as one complete unit, but on reflection I feel that it would be more useful to construct it as separate modules. This not only allows for easy development but also enables the modules to be used in other systems.

The sub-units consist of: Regulator and Modulator, Audio Subcarrier Generator, Microphone Amplifier, IF Pre-amplifier, Video Demodulator and Sound Demodulator.

TRANSMITTER SUB-UNITS

The transmitter is divided into three sub-units requiring only the inputs of video, microphone and 12 volts. There is of course the head unit, but I shall not be going into much detail because these have been adequately covered in previous editions of CQ-TV. The main conditions are that the Gunn diode requires +6 to 9.5 volts at up to 100mA for transmit and that tuning is sufficient to develop a 35MHz IF in receive from the mixer diode. Suitable head units are the Solfan and AEI types, which are both readily available from rallies or from the sources quoted in CQ-TV137, p.47. Both of these heads are adjustable to a transmit frequency of 10,250MHz (recommended ATV frequency). Details of how to carry out this adjustment are described in CQ-TV 136, pp.8-10.

MODULATOR AND REGULATOR, Fig.1

Varying the voltage to a Gunn diode causes its frequency of oscillation to change, therefore all that is required basically is a simple series regulator to control the supply voltage, and hence the frequency. The Gunn diode, as well as providing the transmit carrier, also generates the local oscillator for the receive mixer diode in the head. Thus, the regulator needs to be adjustable over its voltage range to allow the Gunn diode to provide a VFO covering the band, causing the mixer diode to generate the 35MHz IF. However, this is further complicated by the requirement to modulate a video signal onto the carrier. This means that the regulator needs to be just a little more complex than a simple series circuit. The circuit shown here has proved to be very stable and provides a well modulated signal.

TR1 provides the regulated 10 volt supply for various parts of the transceiver from the 12 to 15 volt main supply. The Gunn diode supply regulator consists of pass transistor TR2, which should be fitted with a heatsink, controlled by IC1c and TR5. Regulation is achieved by the reference voltage on pin-10 of the IC being compared internally to the output sample voltage on pin-9. The reference voltage is taken from the 10 volt supply via R18 and Vr2 and the IC is also supplied from the stabilised line. Vr3 is the tuning control allowing the frequency of the Gunn diode to be adjusted through the range determined by the value of R21, (nominally 2k2) which should be selected on test when initially setting up the transmitter. The reference pin-10 of IC1c is also fed with an automatic frequency control (AFC) signal from the IF amplifier allowing for signal tracking when in receive.

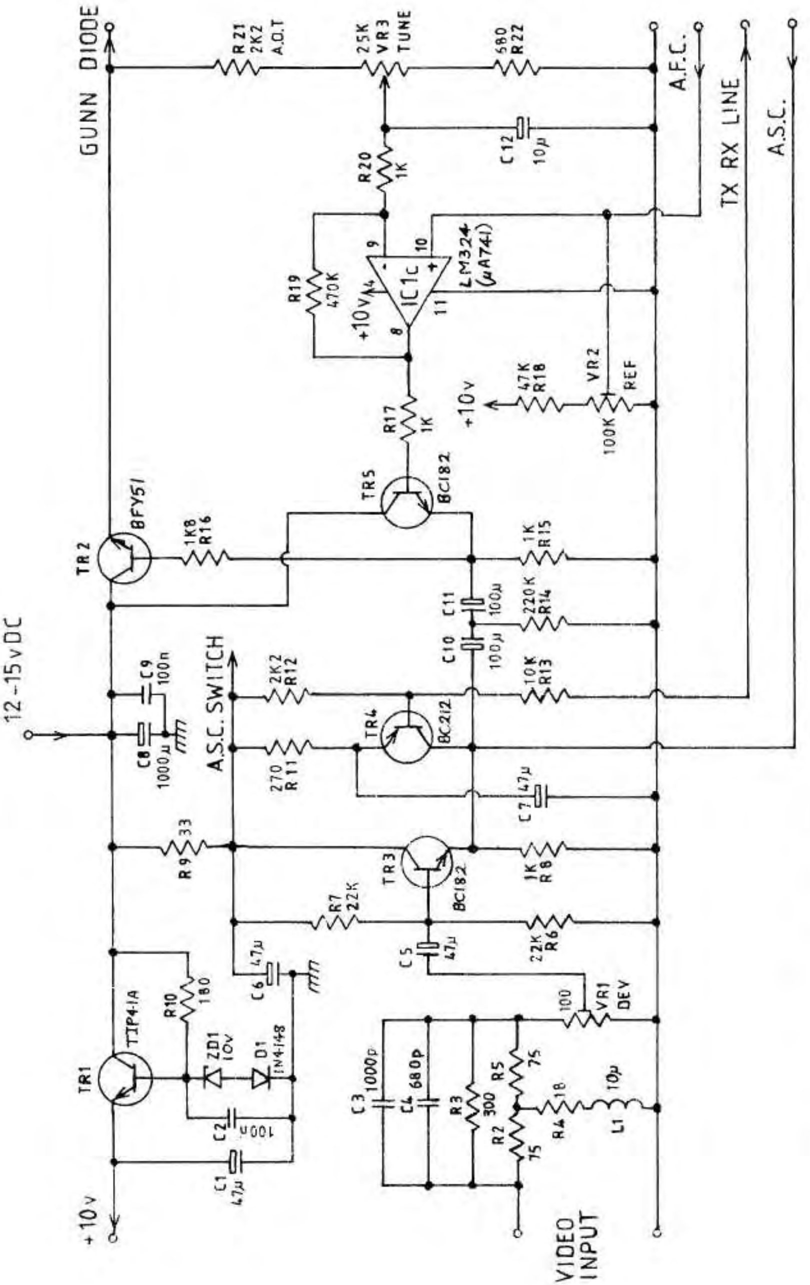


Fig.1 Gunn diode modulator, tuning, video switching and voltage regulator.

The video input is routed via a standard CCIR pre-emphasis network - see CQ-TV 131 p75, (this could be made switchable if required with a 6dB attenuator) to TR3, video deviation is adjusted by VR1. The output from TR3 is fed via C10 and C11 to the Gunn diode regulator causing the voltage to swing about the mean and hence frequency modulating the video onto the carrier. The sound subcarrier is also fed into the modulator via C10 and C11.

TX/RX switching is achieved by TR4. During transmit the PTT line is held (via the PTT switch) at 12 volts, causing TR4 to turn off and TR3 to conduct. In receive the PTT line is held at 0 volts, turning on TR4 and hence turning off TR3 by applying 12 volts to its emitter. The sound subcarrier input is suppressed in the generator during receive. It is advisable to use the recommended BC212 device for TR4 as it exhibits a low emitter to base capacitance and thus minimises signal leakage.

SOUND SUBCARRIER GENERATOR, Fig.2

The sound subcarrier is developed by a Collpits oscillator based around TR7. The frequency of the subcarrier is adjusted by L2 and should be set to 5.9996MHz. The audio signal is frequency modulated onto the subcarrier by varicap diode D4, which is a high capacity type as found in the tuning circuits of modern MW radios. The specification for the diode is that it exhibits a capacitance of 300pF at a bias of 3 volts. The specified KV1236z device is fairly expensive, so it may be worthwhile experimenting with several lower capacitance types in parallel to give the required value.

Tr8 acts as a buffer for the oscillator and TR9 routes the subcarrier to the modulator, the level of the subcarrier being adjusted by VR6. Suppression of the output during receive is effected by the switching transistor TR10. This transistor is actuated by the PTT line and its operation is as described for TR4 in the modulator.

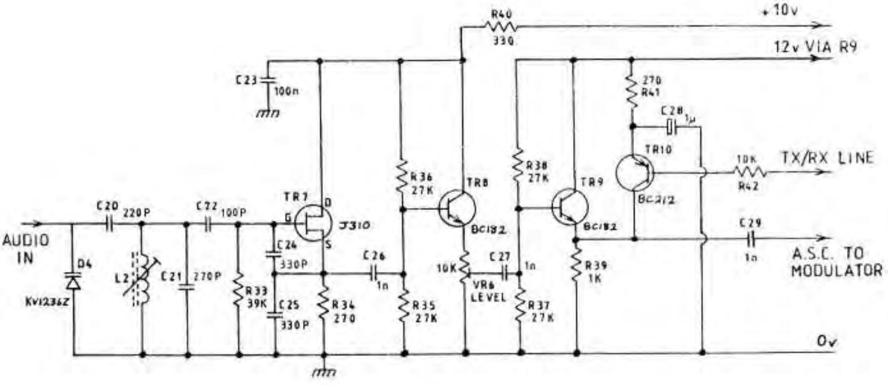


Fig.2 ASC oscillator and switching

MICROPHONE AMPLIFIER, Fig.3

The audio signal from a microphone requires considerable amplification before it can be modulated onto the subcarrier, and this is carried out by IC1a and b. Diodes D2 and D3 act as a simple limiter and should be germanium types. The biasing network of R29, R30 and R31 at pin-5 sets the DC output voltage at pin-7 of IC1b to about 3.3 volts. This voltage is the bias supply for the varicap diode D4 in the subcarrier generator, and centres the range of capacitance swing of the diode.

During receive, although the subcarrier is not routed to the modulator, it is still running. To stop any interference between the incoming sound subcarrier and this internally generated one TR6 is included in the circuit. Turned off by the low on the PTT line during receive, TR6 switches R30 out of circuit increasing the voltage on pin-5, and hence the output DC voltage to D4 in the subcarrier generator. This in turn alters the frequency of the subcarrier such that it does not interfere with that being received.

A microphone level control VR4 and an audio deviation control VR5 are also provided.

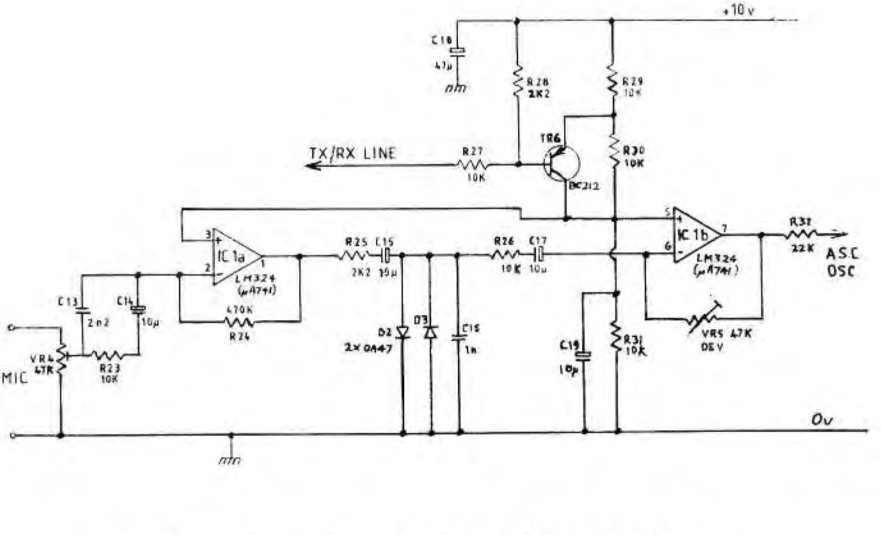


Fig.3 Microphone amplifier and receive offset.

These three modules make up the transmit part of the system, and once again show how relatively simple equipment can be at these frequencies. The receiver, as is the nature of such things, is rather more complex in design but is, however, simple to build and align, there being no need for any specialised test equipment.

IF PRE-AMPLIFIER, Fig.4

The IF pre-amplifier should be mounted as close to the mixer diode in the head unit as possible. L3 is a DC shunt for the diode and can be any variety of HF choke.

The SL560 (IC6) is configured in the low noise-high gain mode with a high pass filter comprising C33, C34, C35, L4 and L5 at its output which cuts off at about 25MHz. L4 and L5 are constructed from 10 turns of 22swg enamelled copper wire, air-spaced with an internal diameter of 0.25 inches. Filtering of unwanted frequencies above 50MHz is carried out internally in IC7, which provides further IF amplification. L6 is not critical and like L3 can be any variety of HF choke. The output of the pre-amplifier, which is controlled by VR7, should be routed to the IF amplifier via good quality coaxial cable.

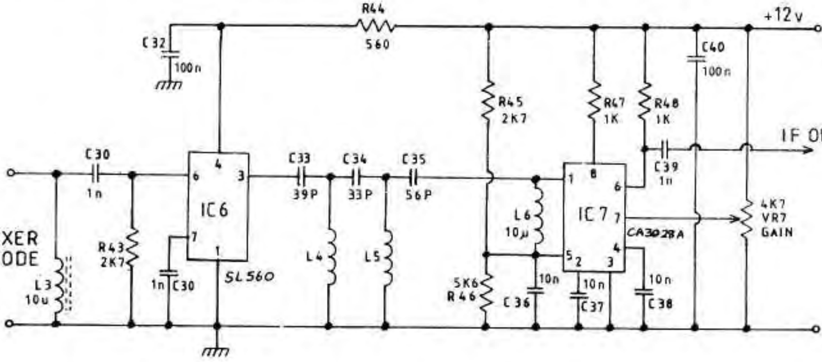


Fig.4 IF pre-amplifier and high-pass filter.

IF AMPLIFIER AND VIDEO DEMODULATOR, Fig.5

The incoming signal from the pre-amplifier is fed to IC2 via a toroidal transformer (T1), which is constructed using 28swg enamelled copper wire wound onto a 0.25 inch OD ferrite ring, the primary winding has 4 turns and the secondary 11 turns.

The TDA2540 (IC2) is a general purpose 'jungle' IC found in many broadcast receivers, performing IF amplification, AGC, synchronous demodulation and video buffering. The more usual AGC output at pin-4 is used in this circuit to drive the 'S' meter, which in the prototype had a 200uA FSD movement. Zero calibration of the 'S' meter is adjusted by VR8.

The amplified output of IC2 is fed to TR11 via another toroid T2, which is constructed on a 0.25 inch OD ferrite ring using 28swg enamelled copper wire, the primary having 10 turns and the secondary 2.5 turns. Tr11 matches the impedance from T2 to the phase comparator demodulator IC3, which is the infamous NE564. The on-board oscillator of the NE564 is adjusted by VC1, the differentiated output of the oscillator and the incoming signal is taken from

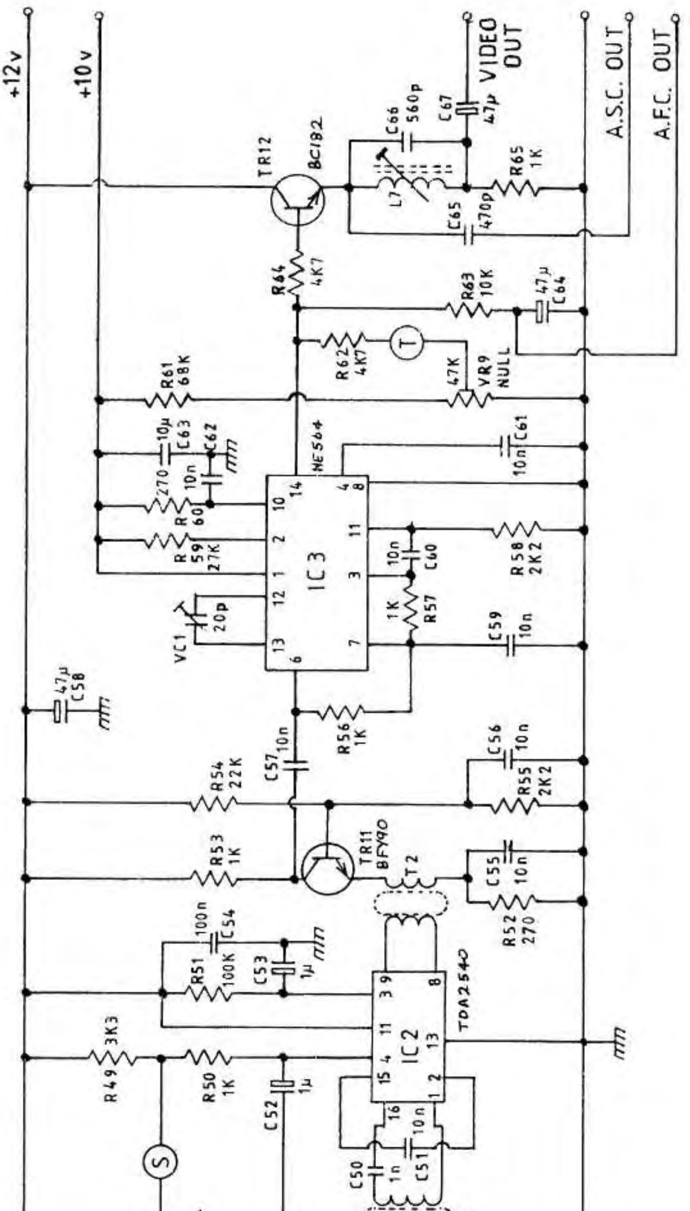


Fig.5 IF amplifier and demodulator.

the IC at pin-14 and carries the video signal and sound subcarrier. Under 'no signal' conditions, or when correctly tuned to an incoming signal, the DC voltage on pin-14 of the NE564 will be of the order of 4 to 4.5 volts. As the receiver is tuned about an incoming signal this voltage also varies about the mean 4.3 volts, thus a centre-zero voltmeter has been incorporated into the circuit (T) to facilitate accurate 'netting' onto incoming signals. Control VR9 provides adjustment of the meter to zero when under 'no signal' or correctly tuned signal conditions.

An AFC control voltage for the Gunn diode supply is produced by R63 and C64 and routed to the regulator. This voltage should provide compensation for the drift encountered from incoming signals by varying the regulated supply to the Gunn diode, and hence the local oscillator frequency.

The output is buffered by an emitter follower, Tr12, and the video routed via a conventional 6MHz sound trap to remove the audio subcarrier.

VIDEO OUTPUT, Fig.6

The video output stage utilises an LM359 (IC4), the first half of which has the gain fixed at approximately 10x by R66 and R68 (R68 may be adjusted on test to give an overall video gain to suit individual requirements). The HF response of the stage is controlled by C68, the lower its value the higher the bandwidth. The amplified video is fed via a standard CCIR de-emphasis network, (CQ-TV 131 p76) to the second half of IC4, which is configured in an adjustable gain mode. If required the de-emphasis network may be made switchable, inserting a 6dB attenuator in the path when in the non-emphasised mode. The video output is taken from the constant current output of IC4b at pin-14 in order that a 75 ohm load can be directly driven without the need for a separate video output stage.

The gain of IC4b is adjusted by VR10, which alters the amount by which TR13 turns on, thus lowering its resistance and hence the gain of the IC. Diodes D5, D6 and D7 act as a voltage tripler sampling the video and generating a voltage source for the gain control network. As the tripled sample voltage is dependant on the level of the video output from IC4b, the gain control circuit will exhibit automatic gain control, thus giving a constant amplitude video output for the monitor.

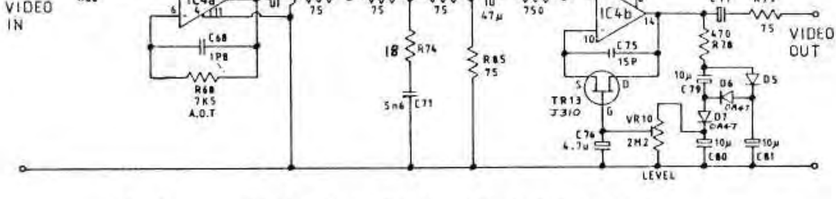


Fig.6 Video de-emphasis, AGC and output

AUDIO DEMODULATOR AND OUTPUT, Fig.7

A single chip design is used for the audio demodulator and output, built around the TDA1190Z (IC5). The incoming audio subcarrier is fed through a 6MHz ceramic filter (FL1) to the limiting amplifier within the IC. L9 is tuned to 6MHz and acts as the load for the internal quadrature detector. The volume control is a 22k potentiometer connected between pin-6 and 0 volts (R84 is included to maintain stability and stop self-oscillation). Reducing the resistance of the volume control increases the audio output from pin-9, which at a maximum will be about 1.5 Watts into an 8-ohm load. Although the device has cooling fins it is advisable to provide extra heat-sinking if the unit is to be used at high output for prolonged periods.

Note: A TDA1190 device may be used instead, in which case the volume control should be 2.2k in value, and R83 and R84 removed from the circuit.

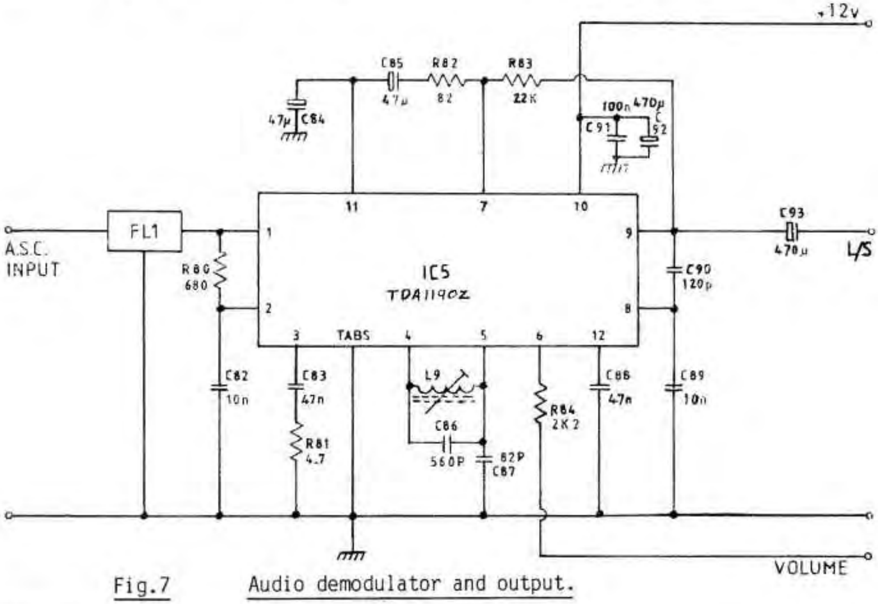


Fig.7 Audio demodulator and output.

CONSTRUCTION

The prototype was constructed on a single double-sided PCB but, as explained earlier, I now consider it more convenient to construct the transceiver in modular form, thus giving greater flexibility.

The modulator, audio subcarrier generator and microphone amplifier may be constructed using Vero board. The receiver modules are best built using good quality double-sided PCB, the boards being fitted into die-cast boxes to ensure adequate screening from extraneous signals (ie: radio control ehthusiasts who also operate on hills at 35MHz!). All signals and supplies should be routed in and out of the boxes via BNC sockets or feed through capacitors accordingly.

As previously stated, good quality coaxial cable should be used between the IF pre-amplifier and the IF amplifier. Within the receiver modules all components should be mounted with as short leads as possible. C51 in the IF amplifier should be mounted as close to the IC as possible, and all leads too and from the board ideally as short as is practicable, likewise this also applies to the pre-amplifier. All the boards must be well earthed to the die-cast boxes to provide good screening.

The pre-amplifier must be mounted as close to the mixer diode as possible, keeping the connecting leads very short. All decoupling components on the head assembly connected to either diode should be removed. To improve stability diode D1 in the regulator is best mounted in thermal contact with TR1.

Transmit/receive switching is accomplished using a single pole changeover switch, routing either +12 or 0 volts to the PTT lines. A switch should also be incorporated in the AGC line in order to disable its action as required. The tuning control in the Gunn diode regulator should be a 10-turn potentiometer fitted with a vernier dial.

A VOGAD may be added to the microphone amplifier by omitting IC1a and its associated components and adding the circuit described in CQ-TV 138 p46, feeding its output into R26.

In the prototype I used a quad op-amp for IC1, but in the modular design this will be impracticable. Suitable alternative devices are uA741, TL071 or TL081, all of which are single devices.

SETTING UP

Before connecting the modulator to the head unit VR2 and possibly R21 will require adjustment. If using AFC the voltage on pin-10 of IC1c must be set to the same as that on pin-14 of IC3. Switch the AFC off and with a voltmeter connected between the two IC pins adjust VR2 to give a reading of 0 volts. If AFC is not being used then set the voltage on pin-10 of IC1c to +4.3 volts. Adjust R21 and R22 if necessary to maintain the limits of voltage swing of the regulator between 6 and 12 volts.

WARNING: Gunn diodes are negative resistance devices, the lower the bias voltage, the lower the resistance and hence the higher the current. If bias of below +5.5 volts is applied to the Gunn diode it may be damaged. Also, NEVER look into a head unit with the power switched on. Similarly it is inadvisable to look into, or stand very close in front of, an illuminated dish or launching unit.

Having established that all is well connect the head unit and, with no video input, set the tuning control to mid-way and tune the head unit to 10,250MHz. A suitable method of doing this is explained in CQ-TV136 pp8 to 10, alternatively, if access to SHF frequency measurement equipment is available, adjust the tuning screws on the head unit to give the required frequency. Once the head unit has been tuned adjust VR1 to give between 150 and 200mV of video at the Gunn diode, this will give in the order of 2.5 to 3MHz deviation. (These figures apply particularly to the Solfan head unit which requires about 70mV/MHz, but will prove a good starting point for other head units.)

The audio subcarrier should be adjusted to 5.9996MHz using L2 and the output level set at between 14 and 20dB below the video signal using VR6. Excessive audio subcarrier will cause interference with the video, too little and you will be talking to yourself!

To set the audio deviation measure the voltage on pin-7 of IC1b and the frequency of the subcarrier when switched to transmit. Switch to receive and measure both parameters again. Divide the difference in the subcarrier frequency by the difference in the voltage to obtain a tuning rate. Using the figure thus obtained calculate the voltage change required to move the subcarrier by 50KHz. With a single tone at the input adjust VR5 until the voltage at pin-7 of IC1b has increased by the amount calculated, this will produce an audio deviation of 50KHz. VR5 should be adjusted until just before audio clipping takes place. L9 should be adjusted for best recovered audio with minimum distortion.

In the receive modules VC1 should be adjusted to give a frequency of 35MHz at pin-11 of IC3. Turn VR7 to maximum and tune in a signal. Re-adjust VR7, playing maximum picture strength off against minimum noise. Adjust VR10 to give 1 volt peak-to-peak at the output, and L7 for minimum audio subcarrier interference with the video.

The performance of some mixer diodes may be improved by biasing them. A 5k potentiometer can be fitted in series with the earthy end of L3, decoupling L3 to earth with a 10nF capacitor. Adjust the potentiometer when receiving a picture for best results.

VR8 should be adjusted to give zero on the S-meter with no input signal, and under the same conditions adjust VR9 to give zero on the tuning meter.

OPERATING TECHNIQUES

Building a 3cm transceiver and carting it up to the top of your local hill along with all the attendant gear can often cause disappointment. Firstly, there are not many stations operational (perhaps after you have all built this system matters will improve!). Secondly, you will no doubt find that on that particular weekend you are the only one on the band. The moral of this is that contacts are best planned and arranged in advance with fellow like-minded idiots (sorry read amateurs), also try to pre-determine likely paths.

Once at your location it is a good idea to set up a map on a flat surface and orientate it correctly with respect to north and south. This enables the dish aerial to be at least aimed in roughly the right direction. Aerials used at these frequencies need to possess high gains for good results, thus they also exhibit very narrow beam-widths. My 30 inch cassegrain dish needs to be pointed with an accuracy of plus/minus 2 degrees for best results. Once the dish has been set tune very slowly for a signal, until the aerials have been fully optimised signals may be very weak indeed over extended or non line-of-sight paths. If a negative picture is resolved then you are tuned to the wrong sideband and need to retune to the other one. Care and patience are the key words when operating on 10G. A personal contact with G8NND last year over a badly obstructed 79km path yielded excellent results, but took 2 hours to complete. The received pictures may not always be of the quality you expect and obtain from 70 and 24cm, but P4 to P5 pictures can often be exchanged over 50+km paths using 30 inch dishes.

GOOD LUCK. I hope to work you on 10G soon!

23CM ATV 'DOWN UNDER'

A LOOK INTO THE PROBLEMS ENCOUNTERED BY VK2XRL AND VK2ZUH

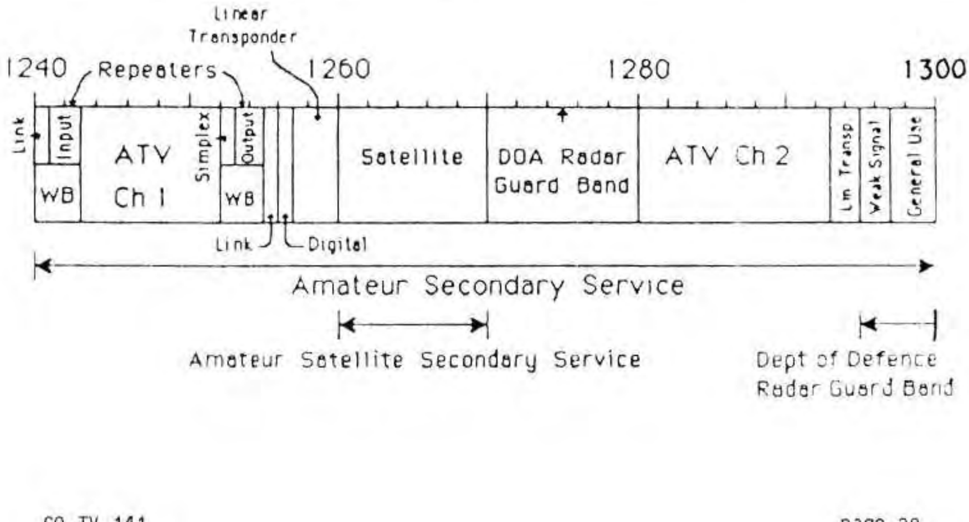
By Richard Carden VK2XRL

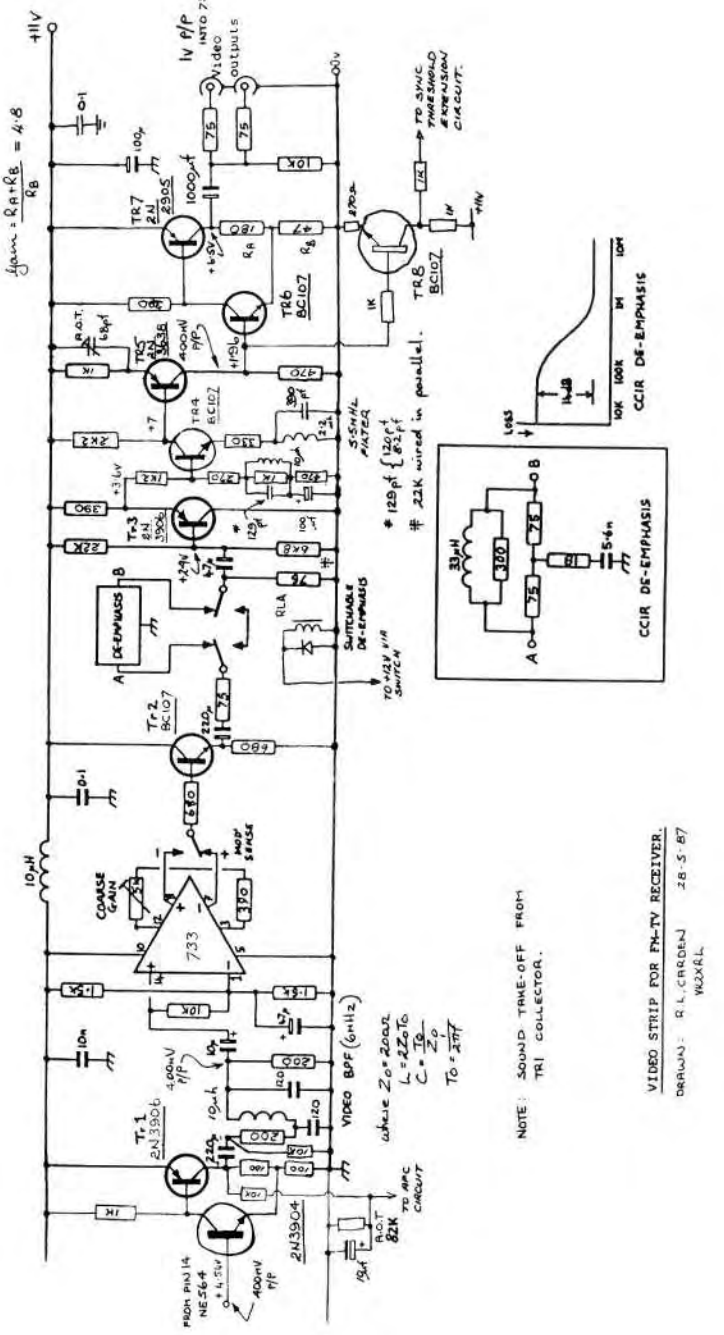
During a visit to the U.K. in May 1986 it was decided to purchase some equipment so that experiments could be conducted on 23cm with FM-ATV. I had the opportunity to talk with Allan Latham from Solent Scientific and, because I wanted something which was easy to carry I settled on the Solent kits. I have to say that we did have a problem with one of the converter kits, but this was soon rectified by the Worthing Group.

Receivers were constructed next followed by a 1W transmitter so that we could evaluate a complete system. Having checked the receiver output with an oscilloscope and feeding multiburst into both the mini and 1W transmitter (taking into account the de-emphasis) the results appeared to be a little disappointing. The amount of recovered chroma and overall frequency response was somewhat less than I had expected. The video strip was re-worked in places using some of the ideas from CQ-TV and others that have worked for AM ATV. The somewhat modified circuit is reproduced here for those who may be interested.

CIRCUIT DESCRIPTION

The output from the NE564 demodulator feeds a complimentary transistor amplifier having a gain of two, and a bandpass filter having a 6MHz cut-off frequency. The 733 IC amplifier is used for video gain control and signal inversion. The signal then passes to a de-emphasis circuit - via relays if required. The 'tap-off' point for the AFC required a resistor to ground (AOT in circuit) to establish the normal DC conditions for the AGC circuit.





+11V
gain = (RA+RB)/RB = 4.8
1v P/P INTO 75Ω
Video outputs
0v
TO SYNC THRESHOLD EXTENSION CIRCUIT.
TR7 2N 2905
1000μf
100μ
0·1
TR6 BC107
TR8 BC107
TR5 2N 3638
TR4 BC107
Tr3 2N 3906
Tr2 BC107
Tr1 2N3906
2N3904
733
COARSE GAIN
MOD SENSE
DE-EMPHASIS
RLA
SWITCHABLE DE-EMPHASIS
TO +12V VIA SWITCH
5·5MHz FILTER
* 129pf {120pf 8·2pf
# 22K wired in parallel.
VIDEO BPF (6MHz)
where Zo = 200Ω
L = 2ZoTo
C = To/Zo
To = 1/2πf
FROM PIN 14 NE564
400mV P/P
TO AFC CIRCUIT
A.O.T. 82K
CCIR DE-EMPHASIS
33μH
300
75
5·6n
LOSS
10dB
10K 100K 1M 10M
NOTE: SOUND TAKE-OFF FROM TR1 COLLECTOR.
VIDEO STRIP FOR FM-TV RECEIVER.
DRAWN: R.L.CARDEN VK2XRL 28-5-87

The output from the de-emphasis circuit feeds an emitter follower (TR3) and provides boosting of the sub-carrier component by 3 to 4dB. This circuit was used in our 70cm AM TV receiver to great effect. A sound trap is included in the emitter of TR4, the nominal values being adjusted as required. Some frequency compensation is provided by the 68pF emitter bypass capacitor. The output circuit provides two 75-Ohm outputs plus an output for a sync threshold extension circuit. If transistors different from those shown are used some adjustments may be required to the bias resistors for TR3. The overall response in now flat except for a slight peak at 4.43MHz.

The complete unit was wired using the original board where possible and providing a small sub-board for the output circuitry. The feedback capacitor C43 around the AFC IC (a 741) was changed to 0.1uF.

No real problems were encountered with the Solent transmitter, however the pre-emphasis network required the 2n2 capacitor to be replaced by a 1n6 to comply with CCIR specifications.

As yet no real distance has been achieved between transmitter and receiver, mainly due to my poor QTH, however, now that two Loop Yagis have been provided some rewarding results should be forthcoming. It is interesting to note that the W.I.A. Australian bandplan for 23cm does not cater for FM. However the frequency allocation for ATV-2 covers approximately 13MHz so the above system has been set for mid-band ATV-2 which allows for some +/- 6.5MHz deviation.

BROADCAST BAND DX-TV RECEPTION

By Garry Smith and Keith Hamer

We'd like to welcome BATC readers to this column covering broadcast band DX-TV reception. Basically we aim to present a brief resume of conditions experienced by enthusiasts covering the twelve-week period up to the CQ-TV deadline. No doubt many of you will already be involved with DX-TV on the amateur as well as broadcast bands. Consequently you will be aware of the pleasures derived from the hobby of exploring bands during periods of enhanced reception conditions.

Not all DX-TV reception occurs in UHF bands IV and V (channels 21 to 68). TV services in other countries also use channels below UHF between 47 and 230MHz in VHF bands I and III. To take advantage of DX on the VHF bands it is necessary to use a multi-band receiver (look for channels 2 to 12 on the VHF bands) or some form of converter. Band I channels ascend in frequency in the following order: E2, R1/E2a, IA, E3, R2 and E4/IB. More details of these will be given in a later article.

Although the main Sporadic-E season (mid-May to early September) had died down, an upsurge in activity produced "exotics" on September 17th. The best reception dates during the month were as follows:-

- 10/09/87: Sweden on channels E2 and E4 with new "KANAL 1" ident on the test card.
- 17/09/87: A low-power private Italian station called "TVA" seen on test card on IA.
  Unidentified African station on E2 at 1900 GMT from SSE.
  Unidentified Arabic-language/educational programme on E3 from the south at 1805 GMT. Spanish and Portugese signals were around at the time.

The week commencing October 19th was particularly good for Sporadic-E DX with several prolonged openings to Italy. The best reception dates were:-

- 21/10/87: All day opening to Scandinavia and Central Europe in band-1 with Finland E4, Estonian TV on R2, Austria E3 (100W relay), Italian private station called "Telemarket" at 47.6MHz (just below E2), Saarlandischer Rundfunk (West Germany) E2 with "SR1 SAAR" test pattern and digital clock, Polish "Wroclaw" studio identification caption on R2 (may be a 1kW TVP-2 outlet), Jugoslavia on E3.
- 28/10/87: Italian private station "TVA" (Tele Alta Italia) on channel IA with programmes.

During early November, a spectacular tropospheric (trop) DX opening occured with several East German and Czechoslovakian stations noted at UHF. These provided sustained signals in SECAM colour throughout the day, especially on the 6th. The main source of signals tended to be from transmitters located close to the border of Czechoslovakia and West Germany. Many West German TV regions were noted with good clear pictures from NDR-1 and NDR-3 (Norddeutscher Rundfunk), HR-1 (HeBischer Rundfunk) and BR-1 and BR-3 (Bayerischer Rundfunk). The BR-1 test pattern actually carries the transmitter name such as DILLBERG and BROTJACKLRIEGEL. Very few Dutch and Belgian stations were received but many French signals were logged at Band III and UHF. Here's a round-up of the best reception:-

- 04/11/87: Czechoslovakia (CST-1) on R10 in band III from Plzen.
- 05/11/87: Czechoslovakia (CST-2) on R35 (UHF channel 35) from Susice 100kW; Belgian 100W Antwerp relay on E2 logged in Wales (also on the 6th).
- 06/11/87: CST-1 on R7 in Band III from Jachymov 2kW; CST-2 R31 (Plzen), R35 (Susice), R36 (Cheb), R38 (Jachymov) and R39 (Ceske Budejovice); Polish TVP-1 network with test card on R35 from Jelenia Gora; AFN-TV (American Forces TV) on E34 (channel 34) from SHAPE in Belgium using the USA 525-line 60Hz standard "M".
- 07/11/87: Poland TVP-1 on R9 (band III); CST-2 R39 showing the "RS-KH" test pattern.
- 10/11/87: Unidentified test card on E3 via Meteor Scatter DX at 1248.

We would be pleased to hear from any CQ-TV readers who have attempted to DX the TV broadcast bands. Send your reception reports to: Garry Smith, 17 Collingham Gardens, Derby DE3 4FS. On a slightly different topic, we would also be pleased to hear from anyone who may have old video tapes of BBC Test Card "C" together with any of the music which was played during the early

GREAT NEWS!

THE NEW D-100

BE PEPARED FOR EXOTICS DURING THE COMING SPORADIC-E SEASON!

The «DE-LUXE» version of the D-100 DX-TV Converter System now offers multi-system sound reception of DX-TV stations operating on the VHF and UHF broadcasts bands, irrespective of the IF bandwidth selected. The unit is compact and simply connects to the aerial socket of a domestic UHF TV receiver. Since its output is at UHF it offers an easy means of recording TV DX on video.

MULTISYSTEM SOUND

With a little help from your domestic FM radio you can now resolve any of the four intercarrier sound standards used throughout the World, ie, 4.5 MHz (USA), 5.5 MHz (W. Europe and Africa), 6.0 MHz (UK/Eire) and 6.5 MHz (Russia and Eastern bloc countries). During Sporadic-E openings it can also monitor the OIRT FM band, Italian private radio station links and even cordless 'phones.

SWITCHABLE IF BANDWIDTHS

Reduced IF bandwidth operation, preferred by many DX-TV enthusiasts over the years, helps you resolve those stations normally lost in the noise which is often the case when using a multi-standard TV. It assists adjacent channel reception too, so you'll be better equipped for exotics.

BAND II TV CHANNELS

Extra channels above Band I create new DX possibilities -Albania on channel IC and Bulgaria on R3 for example.

«DE-LUXE» version only **£89.99** including P&P (UK only). Please allow 21 days for delivery. Leaflet available. Please send SAE.

TELERADIO NEWS

Published bi-monthly it is <u>the</u> magazine for all DX-TV enthusiasts. Each issue is packed with useful information. Regular features include all the latest news, DX-TV reception reports, logs and photos, technical features, transmitter listings and maps, and much, much more! As a special service to TeleRadio News subscribers there's free advertising for the private exchange of equipment, etc, etc. Annual subscription only **£6.00** (UK).

Back copies at **£1.50** each (UK). List available. Send SAE.

DX TV ON VIDEO

This 33-minute video shows examples of the various types of propagation encountered by DX-TV enthusiasts. The effects of Sporadic-E, Meteor-Shower activity, F2-layer ionisation and examples of enhanced Tropospherics are all featured. This cassette is ideal for newcomers to DX-TV. Available in VHS or BETA (please state format). Only **£14.50** including postage (UK)

A copy of the recently updated "TV DX For Beginners" by Simon Hamer is included **FREE** with the above video, to BATC members, if ordered before the next deadline.

Please send an **18p** stamp for details of other publications and DX products.

HS PUBLICATIONS

7 EPPING CLOSE DERBY DE3 4HR ENGLAND

REVIEW

A COMPUTERISED LOG

By Mike Wooding G6IQM,

Another new software package from the Elan Soft company is an Amateur Radio Log Book database, designed to complement the mandatory log book that we all have to keep.

The program is supplied on a 40-track single-sided disc and will run on any version of the BBC computer. Anyone conversant with operating a filing system on the BBC will have very little difficulty in quickly mastering the facilities available. For those of you who are not, then a little time and patience will be required.

The format of the file on screen is five areas of text containing the fourteen fields of informaton. The contents of each record includes the date, start and finish times, frequency and mode, call sign, reports, locator and QSL information. Also included is an area for brief remarks and the name and address of the staion worked and the aerial system and power used.

The basic facilities of the database are as follows:

1)...Loading in contact informaton.

2)...Modifying records previously entered. Changes can be made to any field within the record.

3)...Searching for any record or any particular data within any field in any record. This is a very powerful feature normally available with such filing systems, and allows for very quick selection of records, or records with similar field data; eg: all GW stations, or all stations worked on a particular date.

Each complete file of records can be given a different file name and the amount of records per file is as listed below:

Acorn DFS 40 Track	400 records
Acorn DFS 80 Track	800 records
Acorn ADFS 40 Track	650 records
Acorn ADFS 80 Track	1300 records

The above figures are the minimum obtainable. For double-sided disc systems they should be doubled.

Another feature of the suite is a print routine that will print out any complete file. The routine is loaded in separately from the disc and prompts for the file name to be printed. It would probably be a good idea to have plenty of paper available!

The package comes complete with comprehensive instructions and, for those of you who would like to keep a computer based log, is almost ideal and may be recommended.

Price; £5.95 (state 40 or 80-track, DFS or ADFS) from ELANSOFT, 3 Abbotsgrange Road, Grangemouth, Scotland FK3 9JD.

CONTEST NEWS

By Mike Wooding G6IQM,

It's Monday September 14th, the day after the International. Closing date for CQ-TV 140 is next Sunday and here I am starting to write the contest news for CQ-TV 141. Such a busy life we lead!

Don't forget the changes in the year's contests; more joint ones with Europe. Please note that because of these joint events more of the contest times are depicted as GMT, please remember to do your mental arithmetic accordingly! I am sorry to say that RadCom has reverted to its original mode of not including minority groups contests (their words concerning the BATC not mine), so please check with CQ-TV or contact me for contest information.

INTERNATIONAL '87

Most of you will nave read by now that this year is the last year the club will have organised the International solely. As from next year it will become an IARU contest, and will be organised each year by a different member country. Next year the UBA (Belgium) will organise the contest, the BATC will be running the 1989 event on behalf of the RSGB.

This year's contest saw a lot of activity, with our regular portable teams out in force. The weather, as usual, was at times somewhat inclement, Saturday was particularly bad with rain and at times very strong winds. Sunday, however, was a lot better, here in Rugby we had a lovely sunny day and I think that it was the same over much of the country. Band conditions were generally flat on 24cm throughout the weekend, and on 70cm propogation was up a little on Saturday and flat on Sunday.

Once again I wish to congratulate you all on the excellent standard of operation during the contest, this year not one genuine complaint to the contrary has been received. Also I wish to thank all those who have sent in entries for your support, it makes the whole thing very worthwhile, as there has been quite a significant amount of work involved with the organisation. Now I have to look forward to several hours sweating over this keyboard correlating all the results into a master set. Finally, I wish to thank my lady for putting up with me!

A few amusing comments from your entries as usual, but first a couple that I heard over the air during the contest:

Len G8ONX bemoaning the fact that he missed working VIV GW1IXE on Saturday...."I wish I had grabbed her last night"....(methinks you are becoming a bad influence up here in the midlands Viv.)

Andy G8LIR: "I'm getting married in a fortnight, I must get my finger out"....belated congratulations Andy to you and your wife, and as John G3YQC remarked, we hope this doesn't curtail your contest working.

Dave GW8VZT: "Pity the bacon got burnt trying to work DX"

Leslie G4TEP: "I seem to have less contacts each year, what am I doing wrong?"

Peter G1COI with particular reference to the weather: "If anyone finds a piece of 70cm aerial flying through the air, please return it in a plain brown envelope to G1COI, QTHR".

AUTUMN VISION

A well attended contest with the usual plethora of idiots (sorry, read portable stations) beaming their signals all over the place. Conditions were generally favourable on 70 and 24, although the weather was pretty awful (as usual I hear you cry). It seems that not a few of you got confused with the bonus - 25 hours. I must admit that the date of the contest was not chosen because of the change from BST to GMT on that day, but it was rather fortuitous. I can say definitely that it won't coincide next year because the contest will be on November 13th, and you will be able to have even more fun because it will be a joint one combining with the SSTV contest.

Before we have a round-up of your comments I guess that I had better eat humble pie and apologise for the typographical (posh eh?) errors that have appeared in the last two magazines concerning the dates of the Autumn Vision and SSTV contests. Once again many apologies, it must be dust from all the house renovating I am doing getting into the works!

Your comments:

Peter G1COI (yes him again) 'Does anybody know of a mountain that's up for sale?'

Bob of the G0AVG mob "Should have stayed at the pub, would have probably scored better!"

G0AVG in three contests have gone from 'Average Video Group' via 'A Veritable Goof' through 'All Very Good' to 'Astonishing Video Group'. Any ideas?

RESULTS

Due to the non-arrival of some of the European results at the time of going to press, I have only included the U.K. results of the International, the full results will appear in CQ-TV 142.

Hearty congratulations for the second year running to Andy G8LIR, Fred G4GCO and Ron G4SHC, who are the GW8LIR team, for their resounding win on 70cm. I think it is fairly safe to say, having certain other results in from France, that they will win overall. The equipment set-up was the same as usual, the only change being that this time they worked all through the night.

It is also very gratifying to see the first four positions held by portable stations, and that out of the first twelve, eight were portable. Congratulations to Peter G1COI and to Dave, John and Pete, the GW8VZT team for their positions, unfortunately I think that you will not be quite so well placed overall.

How about that rare DX station G3RDC (G3YQC's brother) - I missed him too!!!

INTERNATIONAL '87 U.K. RESULTS 70cm

Posn	Call	Points	Contacts	Best Dx @	Km
1	GW8LIR/P	20703	73	ON4YZ	611
2	G1COI/P	11154	27	F6FZO/P	402
3	GW8VZT/P	10359	46	G1COI/P	296
4	G8MNY/P	6318	34	GW8LIR/P	212
5	G4CRJ	5536	29	F6IFR/P	262
6	G4WRA/P	5237	33	G1COI/P	200
7	G4DVN/P	4983	37	G4CRJ	189
8	G3NAQ	4089	21	PE1LZZ/A	391
9	G0AVG/P	3942	24	G8LES	217
10	G4VTD	3017	16	GW8LIR/P	277
11	G6YKC	2915	21	G3NAQ	168
12	G6HJP/P	2633	20	GW8LIR/P	280
13	G6IQM	2388	21	GW8LIR/P	151
14	G3YQC	2074	18	GW8LIR/P	148
15	G8GKQ	1847	7	GW8VZT/P	269
16	G8ONX	1794	15	G8LES	142
17	G0HOV	1779	16	GW8LIR/P	139
18	G6ZHC	1327	10	GW8LIR/P	211
19	G1KUG	1107	13	GW8LIR/P	130
20	G3UKM	1042	10	GW8LIR/P	122
21	G4TEP	310	5	G8LES	76
22	G3RDC	306	1	GW8LIR/P	148

INTERNATIONAL '87 U.K.RESULTS 24cm

Posn	Call	Points	Contacts	Best Dx @	Km
1	G4WRA/P	1670	11	G4VTD	138
2	G4DVN/P	1366	11	G4WRA/P	126
3	GW1IXE/P	1056	15	G8VPG	61
4	G6YKC	706	7	G4WRA/P	107
5	G3YQC	612	8	G4DVN/P	101
6	G6IQM	592	7	G4DVN/P	105
7	G4VTD	574	4	G4WRA/P	139
8	G8MMF/P	466	5	G4WRA/P	72
9	G4CRJ	348	4	G4VTD	57
10	G6HJP/P	266	9	G8LES	32
11	G0HOV	85	4	G4WRA/P	47
12	G6ZHC	44	1	G8MMF/P	44

Altogether a spectacular achievement by Andy and Co. the G4WRA team for their U.K. win on 24cm. Not bad for the first time you operated the gear portable lads.

A well deserved win on 70cm in the Autumn Vision contest for the GW8ZJY team, they are always out there these old men (sorry lads I couldn't resist that one). The chequered flag also goes out to John G1GST for his win on 24cm (but look who's second!).

AUTUMN VISION 70cm

Posn	Call	Points	Contacts	Best Dx @	Km
1	GW4ZJY/P	6821	32	G8GKQ	269
2	G0AVG/P	2812	18	G4CRJ	174
3	G4CRJ	2442	16	G4GCO	242
4	G6IQM	2010	20	G4GCO	158
5	G4GCO	1860	7	G4CRJ	242
6	G1COI	1852	12	G4GCO	229
7	G4VTD	1834	12	GW4ZJY/P	238
8	G8GKQ	1771	8	GW4ZJY/P	269
9	G1GST	1743	17	G4VTD	190
10	G8MNY	1682	13	GW4ZJY/P	240
11	G8ONX	986	12	GW4ZJY/P	120
12	G0HOV	907	12	G4GCO	150
13	G1JZJ	701	11	GW4ZJY/P	97
14	G6XDY/P	474	7	G4CRJ	85
15	G8XMF/P	447	6	G8MNY/P	86
16	G0EIY	273	6	G0AVG/P	69

AUTUMN VISION 24cm

Posn	Call	Points	Contacts	Best Dx @	Km
1	G1GST	738	7	G6YKC	84
2	G6IQM	530	8	G6YKC	74
3	G3YQC	472	9	G6YKC	69
4	G6YKC	434	4	G1GST	84
5	G4VTD	430	12	G8GKQ	148
6	G4CRJ	86	4	G4VTD	57
7	G8GKQ	296	1	G4VTD	148

The address for information, entry forms, log sheets and contest entries is shown below. Please remember to enclose an A4 SAE when requesting the above or if wanting certificates. Remember every contest entry is awarded a BATC certificate. See you at the convention April 24th - Cheers.

MIKE WOODING G6IQM, 5 WARE ORCHARD, BARBY, Nr.RUGBY, WARKS, CV23 8UF

Forthcoming contests:

SPRING VISION
JOINT EUROPEAN
1800 SAT MARCH 12th to 1200 SUN MARCH 13th
FSTV ALL BANDS

MAY-DAY MICROWAVE
0001 to 2359 MONDAY MAY 2nd
FSTV 24cm and ABOVE

LM1881 VIDEO SYNC SEPARATOR

The LM1881 from National Semiconductors is a recently introduced Video Sync Separator IC. Although originally intended for NTSC systems as used in America, by simply changing the value of a resistor it can be configured for use with PAL systems. With a composite video input of between 0.5 and 2 volts peak-to-peak the outputs are: Composite sync, Vertical sync, Odd/Even field pulses and a Burst gate/backporch pulse. A very useful feature of the device is a default vertical sync output when it is being fed with non-standard signals, such as from home computers, some of which do not produce the normal vertical sync pulses.

The pin connections and block diagram of the IC are shown in Fig.1. The value given for R-SET is that when being used in an NTSC system, varying this value will allow the device to operate at horizontal scan rates up to 64KHz. (NTSC line scan frequency is 15.734KHz, PAL is 15.625KHz). As can be seen the only other components required are an input capacitor and an R-SET decoupling capacitor, both of which are recommended to be 0.1uF. The device operates from a single supply rail of between +5 and +12 volts.

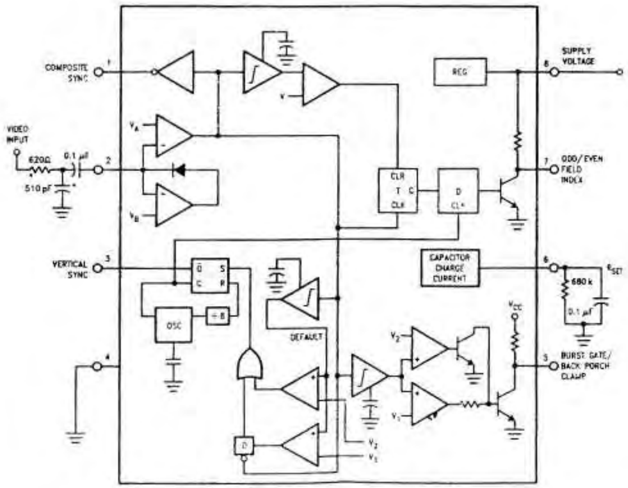


Fig.1

COMPOSITE SYNC

The composite sync output (Fig.2b) is a reproduction of the input signal waveform with all the information above black level removed. The signal source for the LM1881 is assumed to be clean and relatively noise free, but some sources may have excessive video peaking causing HF video and chrominance components to extend below black level. A clean composite sync signal can be generated from such sources by filtering the input using a series 620-ohm resistor and a 510pF capacitor to ground for 75-ohm source impedances.

VERTICAL SYNC

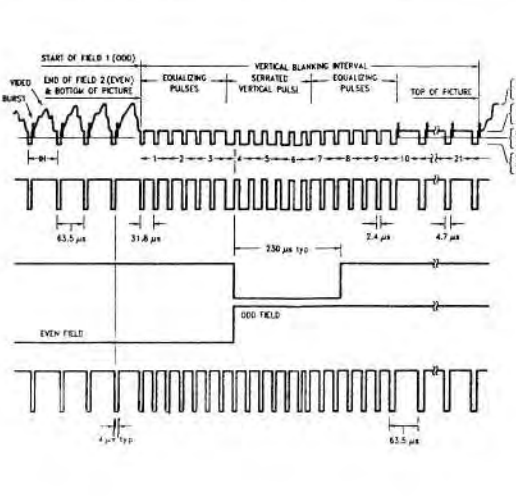
The vertical sync output (Fig.2c) is derived by internally integrating the composite waveform. Due to the long duty cycle the serrated vertical sync pulses are able to charge an internal capacitor past a fixed threshold. Once this threshold has been reached the next serration in the waveform triggers an R-S flip-flop and initiates the vertical output pulse. An internal counter is started which, upon reaching eight, resets the circuit and terminates the pulse. If the incoming vertical sync is not serrated, then the capacitor is allowed to charge to a second threshold which automatically starts the output sequence.

ODD/EVEN FIELD PULSE

The odd/even field pulse can be useful in frame memory storage applications. The pulse is derived by further integration of the composite sync waveform. A capacitor is charged between sync pulses and discharged during them, the result of which is fed to a logic network which compares the output of a flip-flop with the vertical sync. The resultant squarewave pulse is low during the even fields and high during the odd fields as shown in Fig 2d.

BURSTGATE/BACKPORCH CLAMP

The burst/backporch output pulse can be utilised to either retrieve the chrominance burst from the composite video signal (for sub-carrier synchronising) or as a clamp for DC restoration of a video waveform. In a composite video signal the chroma burst is located on the backporch of the horizontal blanking period, which is approximately 4.8uS long. The backporch also acts as the black level reference for the subsequent video scan line. The pulse is obtained by charging another capacitor starting at the trailing edge of the line sync pulses at the end of a line. The output of pin-5 is pulled low until the capacitor charging circuit times out 4uS later as the next line begins, and then returned high. This results in the pulse train shown in Fig.2e.



a. Composite video

b. Composite sync

c. Vertical output pulse

d. Odd/even field index

e. Burst gate/Back Porch Clamp

Fig.2

APPLICATIONS

Apart from extracting a composite sync signal free of video information, the LM1881 outputs allow a number of interesting applications to be developed. As mentioned above, the burst gate/backporch clamp pulse allows DC restoration of the original video waveform for display or remodulation onto an RF carrier, and retrieval of the colour burst for colour synchronisation and decoding into RGB components. For frame memory storage applications, the odd/even field level allows identification of the appropiate field ensuring the correct read or write sequence. The vertical pulse output is useful since it begins at a precise time, the rising edge of the first vertical serration in the sync waveform. This means that individual lines within the vertical blanking period (or anywhere within the active scan line period) can easily be extracted by counting the required number of transitions in the composite sync waveform following the start of the vertical output pulse.

CQ-TV Index Supplement

Introduction.

The following pages list the major articles that have appeared in CQ-TV from issue 137 through to issue 140 (1987). These are printed here as a suppliment to the main index book published last year.

The index contains some abbreviations, and these are explained below. The stock of back issues of CQ-TV is small and variable, so please check in the current issue of CQ-TV for their availability. When stocks of a particular issue get below 10 it is removed from the list in CQ-TV, thus we may have odd back issues still available. Please check with the Publications department if you require a particular issue of CQ-TV.

Abbreviations used.

Page is the page number, and *Photo* is the number of photo copy sheets required for that article. They cost 20p each. The relevant CQ-TV issue number is shown on the left hand side.

The following is a list of the present stock of back issues which cost £1.00 each plus 25p postage.

In stock at the present time are :- 122, 127, 132, 135, 139, 140.

All prices include VAT where appropriate.

All quoted postage costs are for UK 2nd class postage only, so please enquire with the Publications department for the cost of overseas postage.

The above prices are correct at the time of printing but should be checked in CQ-TV magazine before ordering.

PULL OUT AND KEEP

Vision - Switchers/Mixers

Issue	Title	Page	Photo
140	An A/V fader	7	1

Vision - Test/Pattern generators

Issue	Title	Page	Photo
137	Software notebook - BATC logo on a TRS80	74	1
138	The simplest pattern generator	34	1
139	Colorising the Cropredy Test Card	20	3
140	In retrospect	42	1
140	Software notebook No 11 - colour bars	54	1

Vision - Character generators

Issue	Title	Page	Photo
139	Downstream keyer	29	2
140	More MSX software	21	1

Vision - Sync generators

Issue	Title	Page	Photo
137	Scanning and Syncs explained - part 1	7	3
138	Genlocking the 'Handbook 2' colour coder	72	2
138	Scanning and Syncs explained - part 2	38	4

Vision - Cameras

Issue	Title	Page	Photo
138	A 50Hz frequency standard	25	1

Vision - Proc. amps

Issue	Title	Page	Photo
137	Video enhancers - do they always enhance?	64	1
138	An alternative colour encoder	75	2
140	Top of frame ident	11	1
140	Some useful video circuits	44	2
140	Timebase correction	52	1

Vision - Sync separators

Issue	Title	Page	Photo
137	CCT notebook 44, black and burst generator	68	2
140	A modified sync separator for Teletron	71	2

Vision - Other

Issue	Title	Page	Photo
139	The SCART connector	89	1
140	More on SCART	16	1
140	Servicing the TX-90 portable	47	1

Power supplies

Issue	Title	Page	Photo
140	Problems with portable generators	18	2
140	A portable inverter	34	1

Receiving - 70cm

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137	The G-11 TV chassis on 70cm	16	1
139	70cm pre-amplifiers	72	3

Receiving - 24cm

Issue	Title	Page	Photo
137	In retrospect (24cm TX from 133)	36	2
137	Tuning the G3YQC 24cm down converter	28	1
138	24cm - what gear?	66	3
138	Experimenters corner, FM TV demodulator	79	2
140	The 24cm experience	14	1
140	An intercarrier sound demodulator	79	2

Aerials

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Microwaves

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140	LMW 1.3GHz pre-amplifier	35	2
140	Mitsumi TVRO modules	65	2

Slow Scan

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137	SSTV - new standards for old monitors	71	2
137	SSTV on the BBC computer - part 1	51	4
138	A mechanical camera for SSTV and NBTV	54	1
138	SSTV on the BBC computer - part 2	60	3
139	Grey/Color bars for the WYC scan convertor	38	2
139	In retrospect - 138 and Slow Scan handbook	59	1
139	Software notebook No 10 - SSTV for the Spectrum	41	2
140	SSTV tuning indicator	40	1

Transmitting - 70cm

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Transmitting - 24cm

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140	New aerials and power amplifier for 24cm	63	2

Transmitting - Modulators

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139	Let's build a repeater	50	4
139	TV repeaters - a definitive list	44	1
140	Let's build a repeater - part 2	26	3
140	ATV repeaters - an overseas list	38	1

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CQ-TV Index

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139	Specmanship part 1 - The Decibel	22	2
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138	A digital frame store.	36	1
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140	Video handbook 2nd edition	50	1
140	Two tapes, one video and one audio.	68	2

Satellite

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139	Satellite TV news	58	1

General - On air/Band plans

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General - Other news

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Acknowledgements.

I would like to thank the *Leicester Computer Centre Ltd.* for the loan of an *Apple Macintosh SE* computer and an *Apple LaserWriter plus* printer for the preparation of this index.

Compiled and edited by Ian Pawson, G8IQU, *BATC Publications*, with advice from John Wood, G3YQC, *CQ-TV editor*.

Read CQ-TV regularly and keep up to date on all things television.

NEW VIDEO SWITCH

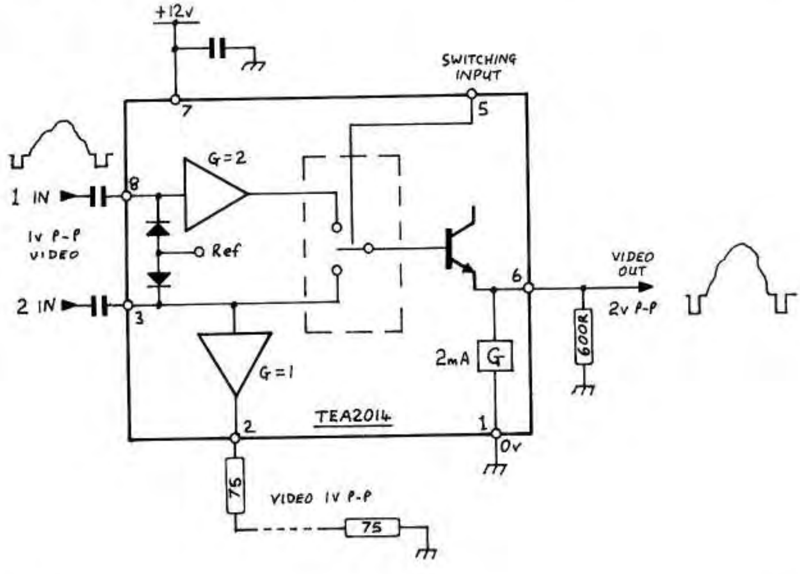
We at CQ-TV are always keen to hear about new devices which might find applications in amateur television. There seems to be a rash of analogue video switches around recently, some of which we have already mentioned, now we have another; the TEA2014.

Dennis Anderson, G6YBC got hold of a sample chip and kindly sent it down for evaluation. It has only just arrived (one week before magazine closing date) so we have not had time to try it out yet. Nevertheless we do have some information and thought that you might be interested. Perhaps someone knows from where they might be obtained, if so please contact the editors.

The device is intended for use within a domestic TV set. Video input-2 is fed back out of the chip, via a unity gain amplifier, for use within the set where it is not required to be switched. Input-1 is for an external feed and this can be switched to the main output. Switching is by the application of a logic level voltage on pin-5 which should exceed 7v. Pin-5 is grounded or simply not connected for input-2 throughput and raised to (say) +12v to switch to input-1.

It is useful that both inputs are to the conventional 1v p-p across 75-ohms standard, as is the monitor output for input-2. The master output however is about 2v across 600-ohms and will need a simple emitter follower to produce the correct output.

The device works from a single 12v DC supply, has a minimum crosstalk figure of 40dB and features DC clamping of the video inputs. Both inputs and outputs have short circuit protection and the IC is packaged in a convenient 8-pin DIL plastic encapsulation.



LET'S BUILD A REPEATER

By John Wood G3YQC

Last time I said I hoped to describe at least one computer control system for an ATV repeater. The system - based on the BATC's TELETRON controller card - although working well, is still being improved and expanded, so it will have to wait a bit longer before being described in CQ-TV.

I do, however, have an assortment of audio/video switching systems for you to consider. All of them are electronic, rather than mechanical and they each have their various merits and possible disadvantages.

A TRANSISTORISED SWITCHER

Fig.1 shows the circuit of a discrete transistor system which I developed some time ago for use in GB3GV. It is controlled directly from the logic card described in the last issue, but can of course be easily controlled from any TTL source.

Four switch elements are provided; two for vision (internal and external signals) and a similar pair for audio. All switches are basically the same and are based on those in CQ-TV 115 and 'The Best of CQ-TV'. The card has an on-board logic gate array which performs a two-state flip-flop function. This ensures good on/off switching and signal isolation. The master video output has an emitter follower buffer stage included to provide a standard level 75-Ohm video output suitable for transmission.

Each switch is provided with a level control. Audio-1 sets the audio level from the internal ident keyer or external audio source. Audio-2 sets the audio signal level from the subcarrier demodulator. The two signals should be of identical amplitude when measured at the master audio output terminal.

Video-1 sets the video signal level from the internal test card generator whilst video-2 sets the video level from the receiver's vision demodulator. Again the two signals should be of identical amplitude when measured at the master video output terminal.

A 'CUSTOM CHIP' DESIGN

Fig.2 shows the circuit in use at GB3RT. The system is based around special analogue switch IC's TEA2014. These chips are of the changeover variety and exhibit very good port-to-port isolation. Switching is accomplished by the application of at least +7v on pin-5, and for this reason a single transistor voltage amplifier has been included to accept a standard logic-level control voltage.

Video input termination is provided by 100-Ohm preset controls and these are used to match the amplitude of the beacon and talkthrough signals, thus ensuring constant deviation of the main repeater transmitter.

Audio input termination is provided, again by preset controls, and these are used to equalise the talkthrough and ident signals.

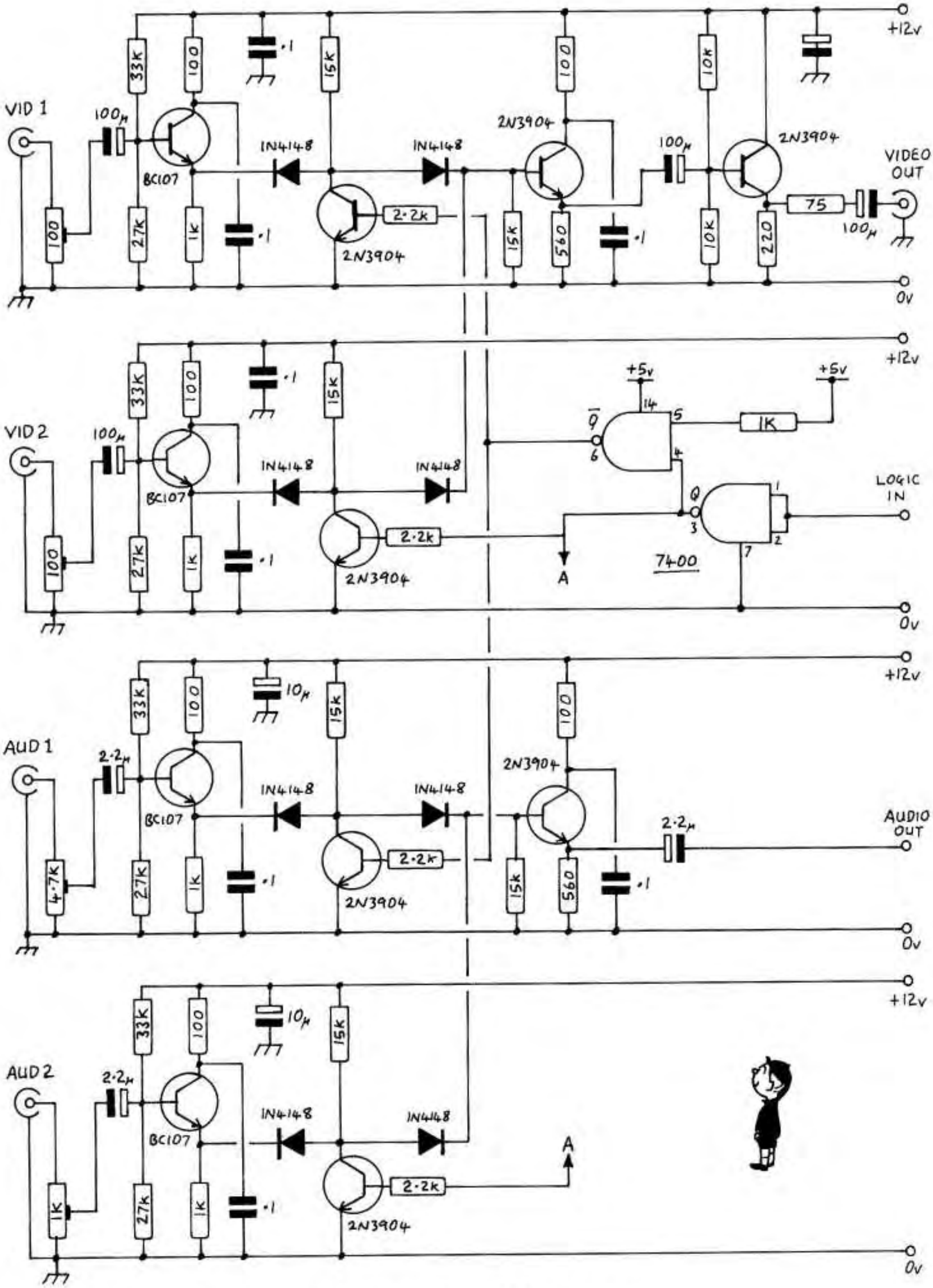


Fig.1 A transistorised A/V switcher

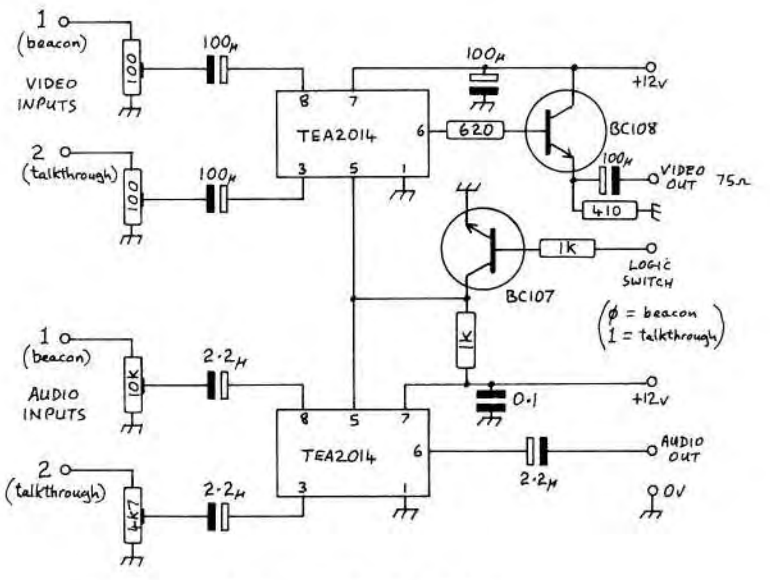


Fig.2 A 'custom chip' switcher

Video input is around 1v p-p into 75-Ohms and audio output is into 620-Ohms but may be connected to a high impedance circuit.

The chips used in GB3RT were samples which were kindly donated to the group so I have no information as to where they may be obtained. Perhaps someone who does would like to pass the information to me at CQ-TV.

A COMPREHENSIVE A/V SWITCHER

This design was sent in by Richard Carden - VK2XRL and it describes the system in use at ATV repeater VK2RTS in Sydney, Australia.

The switcher is capable of selecting up to four different inputs, switching being controlled from a computer output port. Two or three control lines are required for audio and video. These are interfaced via separate 7442 decoder IC's, the third or fourth input being ground (i.e. pin 13/12 7442). With this arrangement it can provide up to eight separate switching functions, however only four or five are being used at present. Logic zero on all inputs is not used.

For video switching, the output from the 7442 produces a logic zero when selected, and interfaces itself via an open-collector hex inverter and transistor to switch on and off a 4066 quad bi-lateral switch IC. The arrangement is the classic series-shunt combination which allows a greater immunity from cross-talk. For colour operation crosstalk should ideally be better than 60dB at 4.43MHz, and each input should be fed to a separate 4066, but tests indicated that two inputs would operate from the one IC without crosstalk. The outputs from the switching circuits are fed via an emitter follower to a downstream keyer which was described in CQ-TV 139.

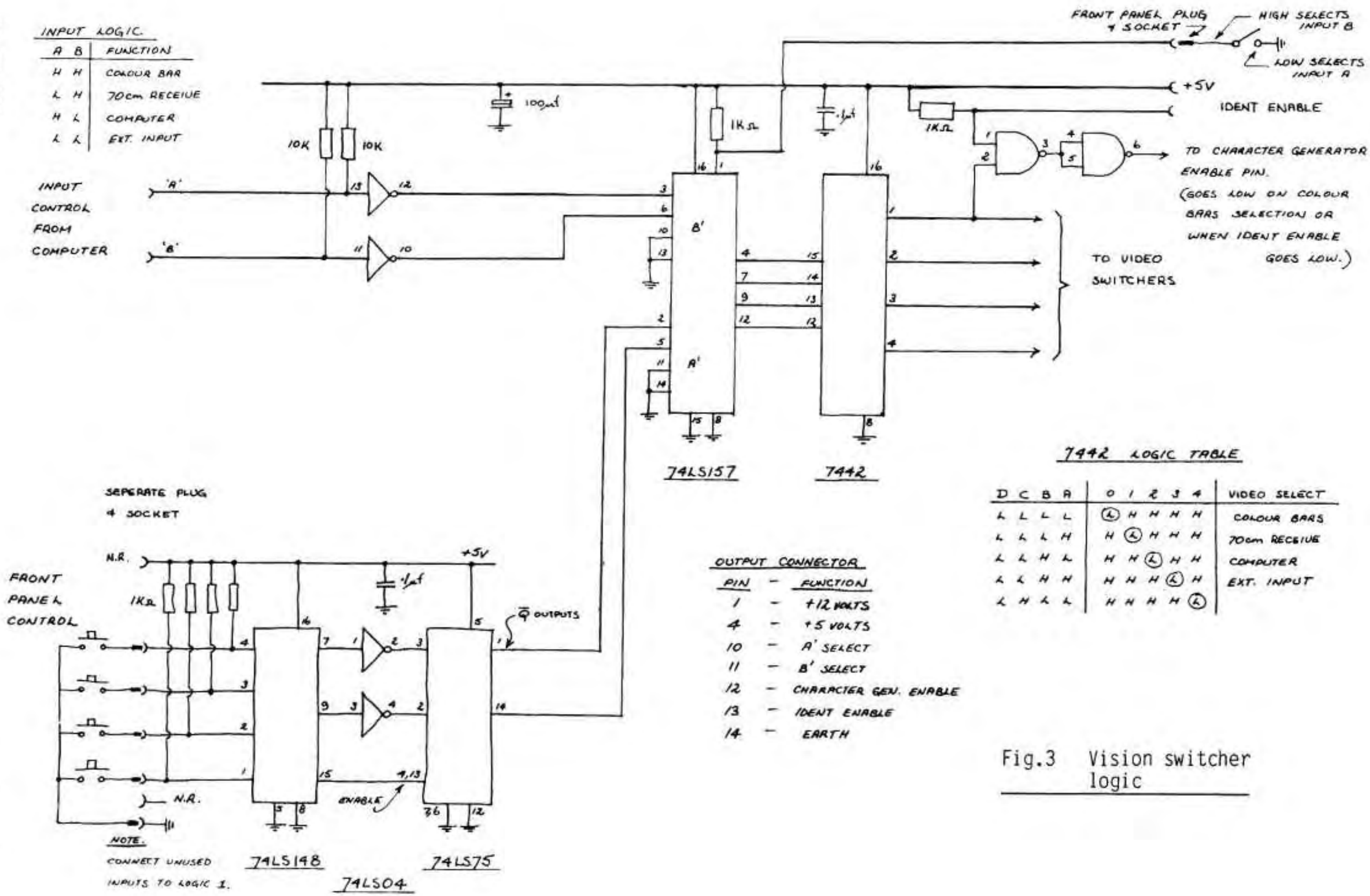
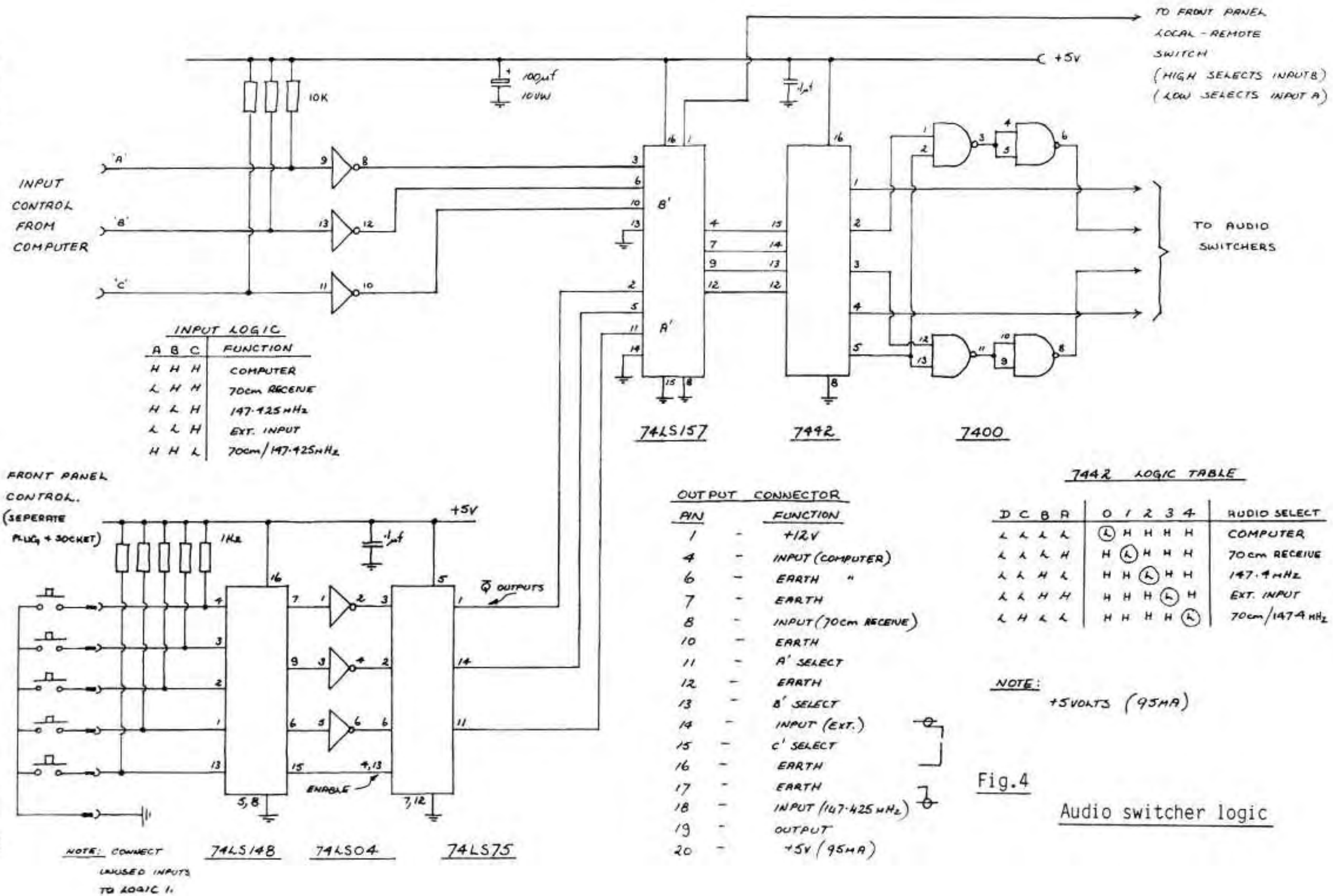


Fig.3 Vision switcher logic



INPUT LOGIC

A	B	C	FUNCTION
H	H	H	COMPUTER
L	H	H	70cm RECEIVE
H	L	H	147·425 MHz
L	L	H	EXT. INPUT
H	H	L	70cm/147·425 MHz

OUTPUT CONNECTOR

PIN		FUNCTION
1	-	+12V
4	-	INPUT (COMPUTER)
6	-	EARTH "
7	-	EARTH
8	-	INPUT (70cm RECEIVE)
10	-	EARTH
11	-	A' SELECT
12	-	EARTH
13	-	B' SELECT
14	-	INPUT (EXT.)
15	-	C' SELECT
16	-	EARTH
17	-	EARTH
18	-	INPUT (147·425 MHz)
19	-	OUTPUT
20	-	+5V (95mA)

7442 LOGIC TABLE

D	C	B	A	0	1	2	3	4	AUDIO SELECT
L	L	L	L	L	H	H	H	H	COMPUTER
L	L	L	H	H	L	H	H	H	70cm RECEIVE
L	L	H	L	H	H	L	H	H	147·4 MHz
L	L	H	H	H	H	H	L	H	EXT. INPUT
L	H	L	L	H	H	H	H	L	70cm/147·4 MHz

NOTE:
+5VOLTS (95mA)

Fig.4

Audio switcher logic

Referring to the video logic diagram (Fig.3) two inputs are provided for computer control, these being held high with a logic zero for operation. The inputs are inverted and feed a dual data-selector IC (74LS157). A logic one on pin-1 provides a through path for input B (i.e. computer control) whilst a logic zero transfers information on input A to its output. Input A is fed via logic from the front panel control allowing manual override if required. The push buttons control a priority encoder IC (74LS148) which encodes the input data to BCD which is then held via a four-bit bistable latch (74LS75).

When the output from 7442 pin-1 goes low, a separate feed passes to an input of a 7400. The other input is taken to a logic one and provides an input from the computer to provide ident enable. The output from the 7400 is fed via another 7400 wired as an inverter to provide a logic zero on colour bar selection or when the computer provides an ident enable.

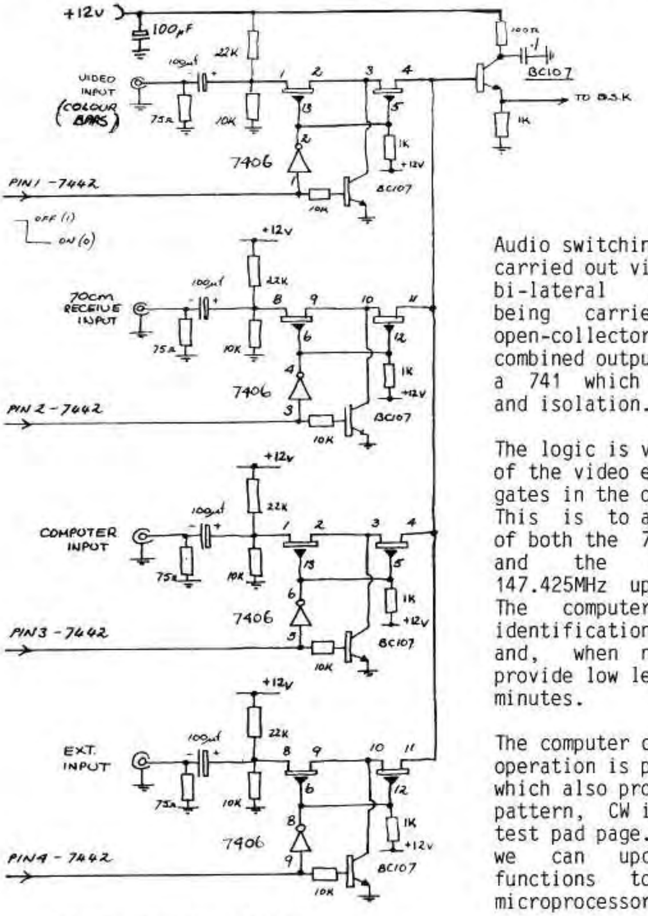


Fig.5 Vision switches

Audio switching (Fig.4) is also carried out via another 4066 quad bi-lateral switch, switching being carried out via an open-collector 7406. The combined outputs are then fed to a 741 which provides some gain and isolation.

The logic is very similar to that of the video except for the extra gates in the output of the 7442. This is to allow switching 'on' of both the 70cm sound channel and the output from the 147.425MHz uplink FM receiver. The computer input provides identification via morse code and, when not switched, will provide low level ident every ten minutes.

The computer control for all this operation is provided by a VIC-20 which also produces its own test pattern, CW ident and touch tone test pad page. It's hoped that we can update the control functions to the 'Teletron' microprocessor unit soon.

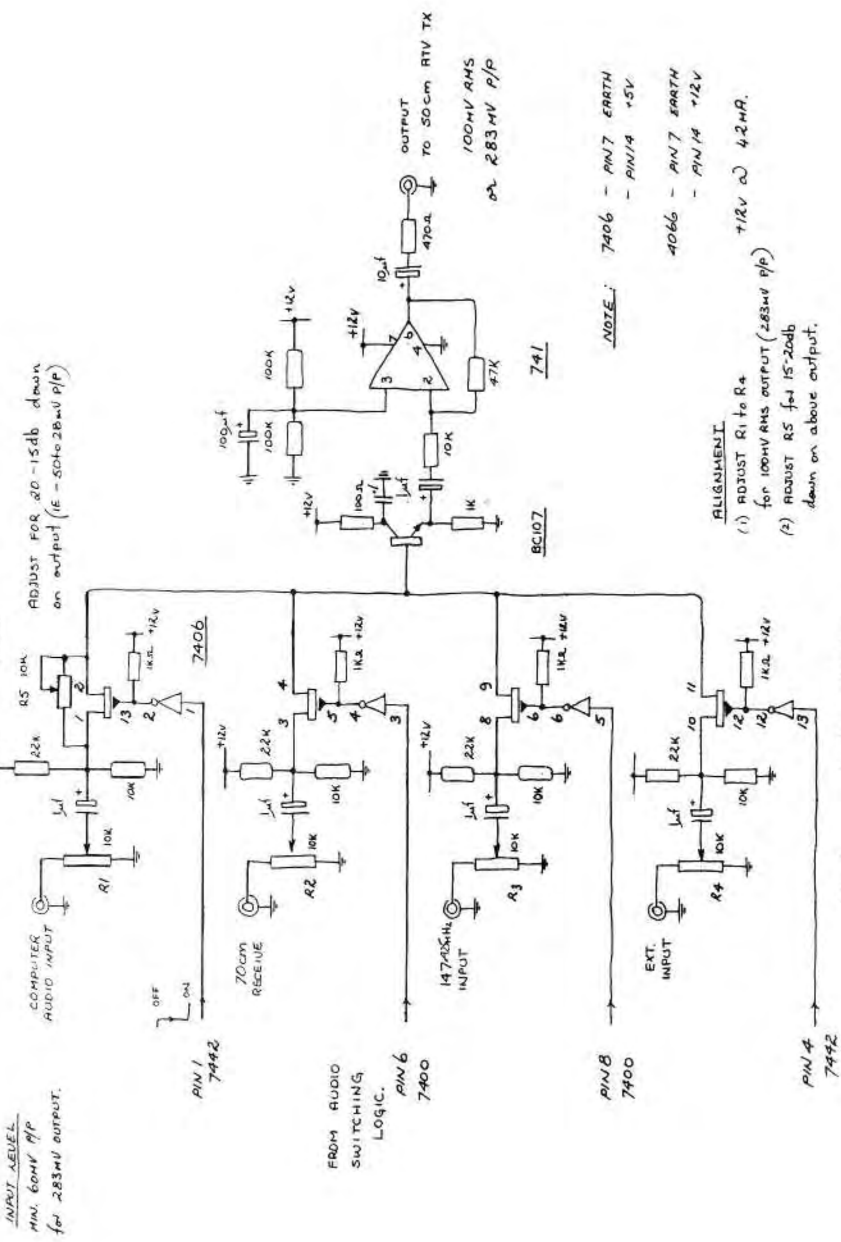


Fig.6 Audio switches

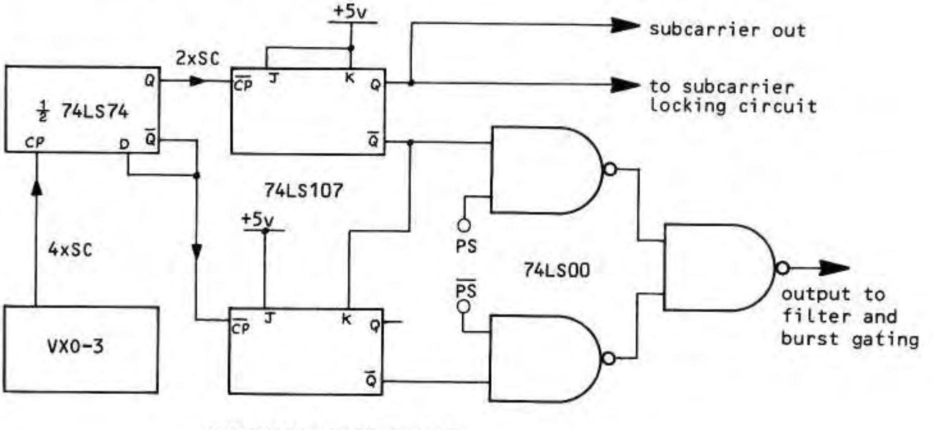
AUTO BURST PHASING

By Bryan Dandy G4YPB

Designs in CQ-TV for black-and-burst generation derive the two phases of subcarrier from RC phasing networks, which require adjustment for phasing and levels. If subcarrier generation is at four times subcarrier (eg. using the VXO-3 device as per the revised ATV Handbook circuit), this part of the circuit can be simplified somewhat (see diagram).

The VXO-3 output is first divided down to twice subcarrier, using half of a dual D-type flip-flop, and the two outputs used to toggle the two halves of a J-K flip-flop. The conversion of FF1-$\overline{Q}$ to FF2-K ensures that FF2 output always lags FF1 by 90°. The two resultant outputs are gated with PS and $\overline{PS}$, and then combined, using three-quarters of a quad 2-input NAND. The remaining quarter can be used in the subcarrier locking circuit.

VXO-3 oscillators can be obtained from QuartSlab Marketing Ltd., P.O.Box 19, Erith, Kent DA8 1LH.



AUTOMATIC BURST PHASING

INTERNATIONAL ATV CALLING 144.750 MHZ

1.3GHZ POWER AMPLIFIER

This article first appeared in the Oct-Nov edition of the "MICROWAVE NEWSLETTER' and we thank the editors for permission to reproduce it here.

By S.Jewell G4DDK,

When operation on the microwave bands is contemplated the problem of how to generate the local oscillator and transmitter signals occurs. A route often taken is to use a BGY22 module to amplify the output from a 'balloon" board and then to drive a diode based tripler to about 1 - 1.5 Watts at 1152MHz or thereabouts. This technique is practical but sometimes prone to instability, especially when the tripler output is then used to drive another varactor diode. Lots of attenuation between the interacting stages can cure the problem, but leads to low overall efficiency. With the cost of new CATV transistors coming down it has become at least as cost effective to amplify at 1152MHz direct. The amplifier described here accepts 10mW output from a low power oscillator board such as the G4DDK 001, and amplifies it to 1-Watt. (The G4DDK 001 local oscillator was originally described in 'RADCOM' Feb and March 1987, and special mention was made to possible modifications for ATV use made in CQ-TV 139, p.55. Circuit boards for this unit are available from the RSGB).

The unit described here has been built several times, each with different components, to prove its reproducability. In each case the amplifier has tuned up identically and output power has been within 0.5dB of 1-Watt, usually on the positive side! No instability has been observed at any stage of tune-up or operation.

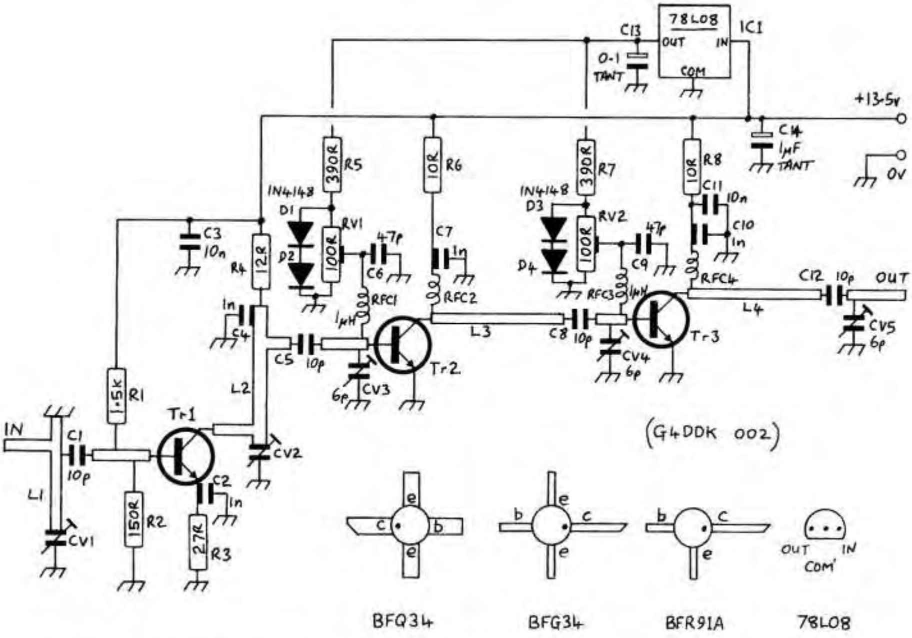
In addition to operation at 1152MHz the amplifier can also be used between 1240 and 1300MHz. Used with a 1296MHz version of the oscillator board a low power 23cm FM/CW transmitter can be made. A bandwidth of 60MHz at a centre frequency of 1270MHz has been measured, suggesting that the amplifier may also be suitable for FM TV use. Last but not least, the amplifier operates in the linear mode, making it suitable for use with a low level mixer/modamp etc., to produce a 1296 or 1269MHz satellite up converter.

The Mitsubishi M57762 amplifier block requires only 1-Watt input for more than 10-Watts output across the whole of the 23cm band. Driven by this amplifier a compact 10-Watt minimum transverter can be built for little more than £100.

Detailed construction notes are not given in this article as it is felt that most microwave enthusiasts will be familiar with the required construction techniques. A circuit board is available from the RSGB.

OPERATION

The first stage of the amplifier operates in Class A at a bias of 17mA. Tuned input and output ensure that only signals in the required operating range are amplified. Murata, Sky or Oxley trimmers are specified for CV1 and 2, but almost any make of trimmer may be used as long as the minimum capacitance is no greater than 0.9pF. An NE021 transistor has been used successfully as a substitute in this stage.



RV1,2	0.25W horizontal skeleton presets.
C2,4,7,10	470 - 1n trapezoidal (coffin) capacitors
CV1,2	0.9pF minimum foil trimmer, Sky, Oxley or Murata
CV3,4,5	Mullard 808 series 6pF foil trimmers
RFC1,3	1uH miniature moulded inductor
RFC2,4	1.5t 1mm tinned copper, 3mm i.d. self supporting
L1,2,3,4	Printed lines on PCB
Tr1	BFR91A, NE021
Tr2	BFG34
Tr3	BFQ34 (also tried: MRF511, TP3095, NE773)

A BFG34 is used in the second stage at a quiescent bias of 17 to 20mA, which is fed from the stabilized 8 volt rail. No suitable substitute has been found for this transistor. The BFR96 is definitely no-go!

The output transistor is a BFQ34, with its quiescent bias set at 35mA, also fed from the 8 volt rail. Several substitutes have been tried in this stage but none of them produced results as good as the BFQ34. It is possible that a change of bias could lead to improved results with some of the substitute devices, but this was not tried.

If 300 to 400mW is sufficient output the BFQ34 and associated bias components may be omitted and the output taken from the pad vacated by TR3 base lead. The match into 50-ohms is excellent at this point.

ALIGNMENT

A heatsink must be fitted to TR3 before any power is applied. Set RV1 and 2 so that the sliders are at the grounded end. Set CV1 to 5 to midway. Connect a 50-ohm power meter to the output but do not connect the input drive. Measure the voltage across R3 which should be 0.44 volts +/- .01v. If this is not the case check for shorts or incorrectly placed components.

With the meter leads across R6 slowly rotate RV1 rotor until a reading of 0.17 volts is indicated. This indicates a bias current of 17mA. This should occur at a rotor setting of about 55% from the supply end, ie. just over half way. Transfer the meter leads to R8 and adjust RV2 for a reading of 0.35 volts (35mA).

Apply drive of 10mW at the required frequency. Carefully re-adjust all trimmer capacitors for maximum output of about 1W. Check with a wide range wavemeter that the only response is at the required frequency, sub-harmonic levels should be so low as to be unmeasurable with almost anything but a spectrum analyser. Remove the drive and check that the amplifier output falls to zero, if not then reconnect the drive and retune, if all is well the amplifier is ready for service.

PAGING THE CROPREDY

By Mike wooding G6IQM,

Although this project is aimed at repeater groups it may also be of interest to those of you using the Cropredy test card generator.

Having been informed by members of the Rugby Television Repeater Group that they would prefer GB3RT to have a changing display in beacon mode, it was delegated to me to devise the method. Our video display is generated by a Cropredy test card board, for which various different test card, colour bar or text screen Eproms can be obtained (Worthing ATV Group). The requirement then is to be able to select Eproms in rotation and present them to the logic on the Cropredy board.

The 'magical' aspect of using memory devices that confuses many people is the way in which they are connected together in parallel via 'busses', one for the address information and one for the data stream. The reason that this can be done is that the memories also have select control inputs. Unless a memory device has its 'chip enable' and 'output enable' controls correctly selected, then it will not output any data to, or receive any data from, the busses. This obviously simplifies connections to and from memories as they can all be paralleled together with just the two control inputs separate for each one. However, in this circuit it can be simplified yet again. By connecting all the 'output enable' controls together and connecting them to the correct logic state (low for 2532 Eproms), only the 'chip enable' controls need to be selected in order to switch the Eprom required.

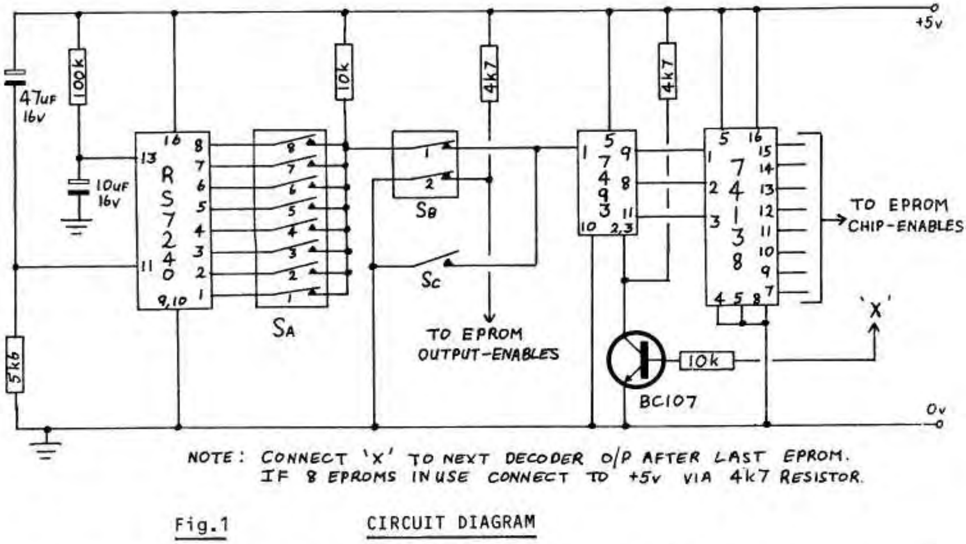
CIRCUIT DETAILS

The basic timing circuit is based around the RS7240 programmable timer IC (RS stock no. 304-582). This is a particularly useful device, having eight outputs, which may be used singly or multiplexed together to give various multiples of the basic delay. The components selected and connected to the control input of the device (pin-13) give a basic delay of one second. The outputs from the timer are fed to an eight way DIP switch (Sa) so that easy selection of the delay can be made. Closing switch Sa1 will output the basic delay of 1sec., closing Sa2 as well will give a delay of 2 sec., closing Sa3 will increase the delay to 8 sec. and so on. A maximum delay of 240 sec. is available in this configuration with all the switches closed. It must be noted here that in this circuit all the switches must be closed, up to and including the one that selects the time delay required. Failure to do this causes a complicated pulse train to be outputted, which would create a display apparently changing at random with often very short delays between switching.

The selected output from the switch bank is routed to a 4-bit binary counter IC (7493) via another switch Sb1. The function of Sb1 is to allow for the automatic switching to be turned off, and, by operating push-button Sc (momentary operation) in this mode, the Eproms can be selected manually. Switch Sb2 has also been included, in order that the video output from the test card generator board can be disabled by removing the control input to the Eprom output-enables.

The pulse train is fed to the clock input of the binary counter, which clocks on the negative-going edge of the logic high pulse, causing the Binary Coded Data (BCD) output on pins 8,9 and 11 to change. The BCD data is fed directly

to the inputs of a 3-to-8 line decoder (74138), the outputs of which change from logic high to logic low in sequence, as the BCD data changes in accordance with the timer pulses. After the counter IC has received eight pulses from the timer it internally resets and the sequence starts again. If less than eight Eproms are being used then the BC107 circuit is utilised to provide the necessary logic high for the forced reset input of the counter. The base connection 'X' of the reset circuit is connected to the next output from the decoder IC after the connection to the last Eprom. Thus, when the decoder is switched to that output, the logic low turns off the BC107 and causes a logic high to be applied to the counter reset input. Once the counter has been reset the decoder output connected to the reset circuit restores to logic high, the BC107 turns back on, causing a logic low to be applied to the reset input and maintains the counter operation until the next reset sequence. As stated earlier, if eight Eproms are in use the counter IC resets internally after receiving the eighth pulse. However, to ensure that the forced reset input is maintained at logic low the base of the BC107 must be connected to +5v via a 4k7 resistor.



NOTE: CONNECT 'X' TO NEXT DECODER O/P AFTER LAST EPROM.
IF 8 EPROMS IN USE CONNECT TO +5v VIA 4k7 RESISTOR.

Fig.1 CIRCUIT DIAGRAM

The circuit is very simple to construct, the original was built on a piece of Vero-board. A regulated 5v supply is recommended to ensure that stray pulses caused by supply rail changes do not interrupt the switching train. The DIP switches were included for easy changes to the system as it was originally designed for use with GB3RT, however, for normal shack use wire links could be used instead. The Eproms can be either mounted on a custom-built mother-board, or more simply, they can be piggy-backed onto each other and the pins soldered, leaving the connections for the output-enables (pin-20 on 2532) and the chip-enables (pin-18 on 2532) disconnected from the socket for direct connection to the switching circuit.

Since I designed the circuit for GB3RT I have also built several more for use on my children's train set and other toys, for switching signals and other displays. So you can see it's quite a cosmopolitan little circuit.

SOUND IN THE STUDIO

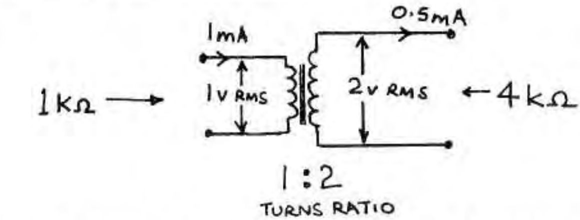
part-2

by John Goode

MORE ABOUT BALANCING.

In the last part I mentioned that in a large professional audio setup balanced wiring for all sound feeds, not just low-level microphone signals, would probably be adopted. This means that a large number of input and output transformers will be used, in some cases for simple balancing, and in other cases for impedance matching. Let's look at how a transformer can transform impedances.

FIG 1 IMPEDANCE TRANSFORMING



Consider a transformer with a 1:2 step-up ratio (fig.1). Across the primary is an AC voltage of 1 volt RMS, causing a current of (say) 1mA to flow. From the primary side of the transformer this will look like a resistance of 1Kohm, as

$$R=V/I$$

However, looking at the secondary, we have a 2:1 step-up, giving 2 volts RMS, whilst the current is stepped-down, giving 0.5mA. The secondary therefore "sees"

$$R=2/0.5 = 4\text{Kohms}$$

Thus, a turns ratio of 2 transforms the impedance by a factor of 4. Because in the formula

$$R=V/I$$

the numerator is multiplied by the turns ratio, whilst the denominator is divided by the same factor, we can say as a general case, that for a transformer

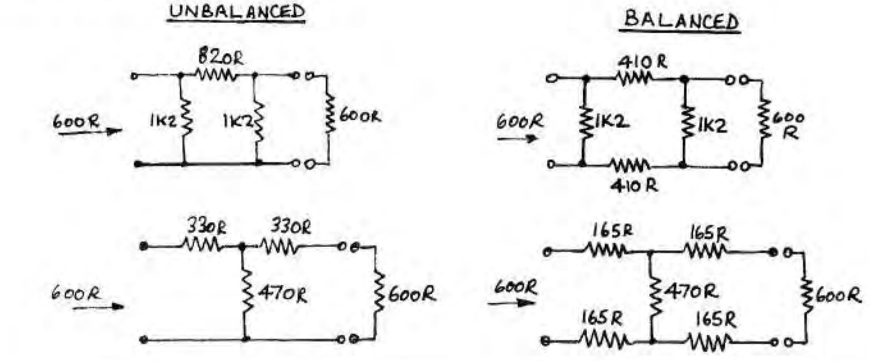
THE IMPEDANCE RATIO IS EQUAL TO THE SQUARE OF THE TURNS RATIO.

This result will be applied when we look at balanced microphone amplifiers.

Most members will be familiar with T and pi attenuators. It is sometimes necessary to attenuate balanced audio feeds, and in these cases the unbalanced networks can be adapted to balanced lines by splitting the series resistor between the two legs. This is illustrated with 600-ohm 10dB pads in fig. 2. As an extension of this, it is also possible to design balanced versions of

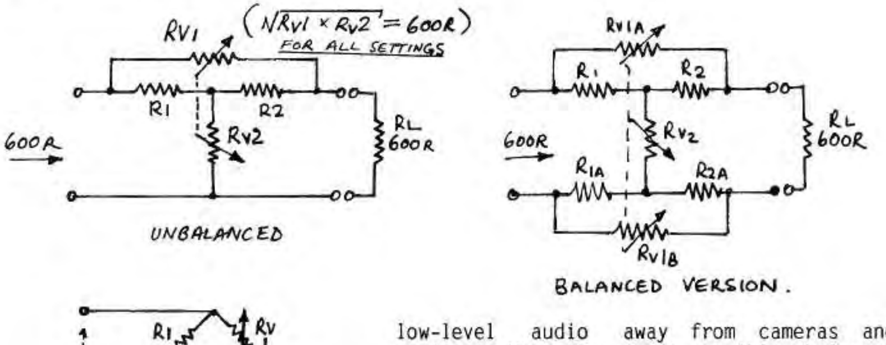
constant-impedance variable attenuators, based on the Wheatstone bridge network. See fig.3. The calculations for these are somewhat beyond the scope of this article, and what I have shown as variable resistors would in practice be 1dB switched attenuators, accurately matched to each other using 1% resistors.

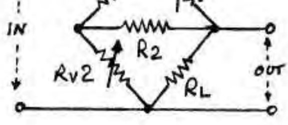
FIG 2. 10dB ATTENUATORS



For small scale and amateur use however, it would only be necessary to balance low-level microphone feeds, and then only if fairly long cable runs were used, or if it was necessary to operate in an electrically noisy environment. In TV studios the magnetic fields emitted by field scan generators, with a fundamental of 50Hz plus harmonics are particularly nasty, so try to keep

FIG 3. VARIABLE ATTENUATORS

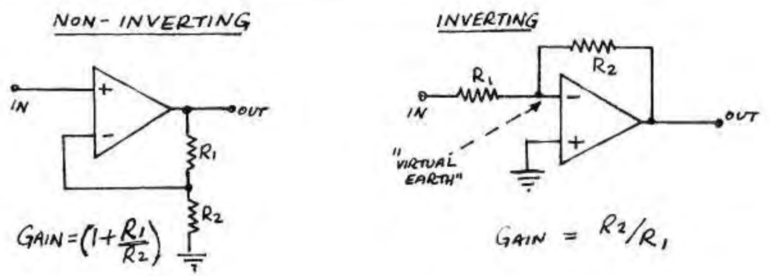




EQUIVALENT CIRCUIT.
(UNBAL).

low-level audio away from cameras and monitors. When this isn't possible, balanced mic working could help. The other situation where balancing is essential is when phantom-powering of capacitor-mics is required, as explained in the last article. However, for the amateur, professional microphones with balanced outputs are rather expensive, the cheapest dynamic mic of this type (I think) being the excellent AKG D190, at around £60. As for phantom-powered capacitor mics, we are talking of £200 plus!

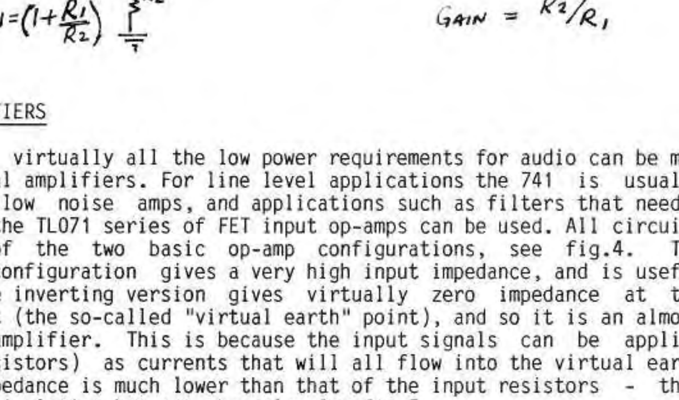
FIG 4. OP-AMP CONFIGURATIONS (BIASSING NOT SHOWN)



PRACTICAL AMPLIFIERS

These days virtually all the low power requirements for audio can be met using operational amplifiers. For line level applications the 741 is usually adequate; for low noise amps, and applications such as filters that need a high slew-rate the TL071 series of FET input op-amps can be used. All circuits are versions of the two basic op-amp configurations, see fig.4. The non-inverting configuration gives a very high input impedance, and is useful as a buffer; the inverting version gives virtually zero impedance at the inverting input (the so-called "virtual earth" point), and so it is an almost perfect mixing amplifier. This is because the input signals can be applied (via input resistors) as currents that will all flow into the virtual earth point as its impedance is much lower than that of the input resistors - this gives very good isolation between channels. See fig.5.

FIG.5 MIX-AMP. CONFIGURATION



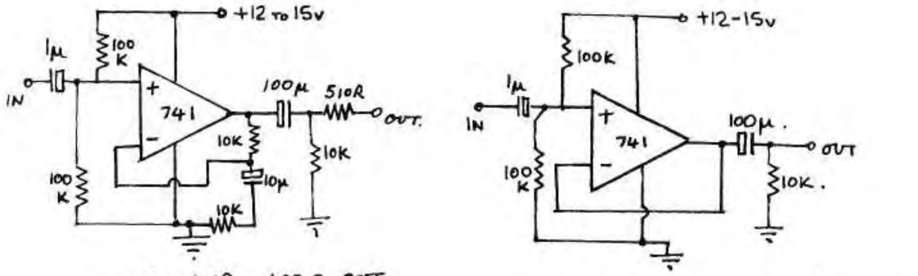
DISTRIBUTION AND SWITCHING.

Fig 6a shows a simple distribution amplifier with a 600-ohm output impedance, 50k input impedance, and a gain of 2 to overcome the matching loss. If 600-ohm working is not required, a simple voltage-follower can be used. See fig 6b.

Switching is best achieved using CMOS analogue transmission gates such as the 4016 and 4066 - however, remember that the supply must be limited to 15volts for these. A good method is to use them at the virtual earth point of a 741 mix amplifier - see fig 7. Of course, switching audio with video is possible by deriving the control volts from a common switching system. In fig.7 the amplifier is set to drive a 600-ohm load; if this is not required the feedback resistor should be reduced to 10K for unity gain, and the bandwidth - limiting

capacitor increased to 680p. The 510-ohm build-up resistor can also be omitted.

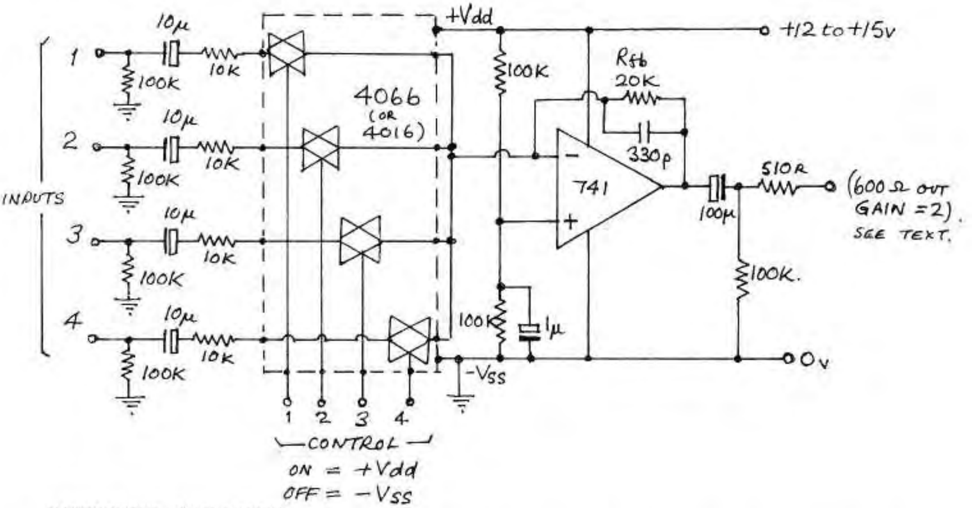
FIG 6. DISTRIBUTION AMPS.



x2 AMP, 600Ω OUT.

X1 VOLTAGE FOLLOWER, (75Ω OUT)

FIG 7. AUDIO SWITCHING



MICROPHONE AMPLIFIERS.

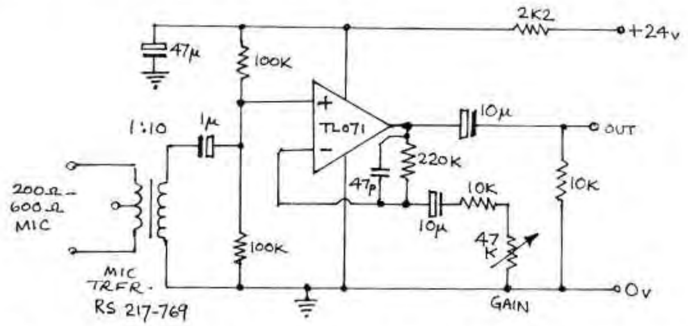
An example of a balanced microphone amplifier is shown in fig.8, using the RS 217-769 mic. transformer (available through Electromail), and a TL071 op. amp. The mic transformer is for matching 200 to 600-ohm mics to 50-Kohms; if we take the source as 500-ohms, and apply the rule derived above:-

$$(\text{Z ratio}) = (\text{T ratio})^2$$

$$(50{,}000/500) = 100$$

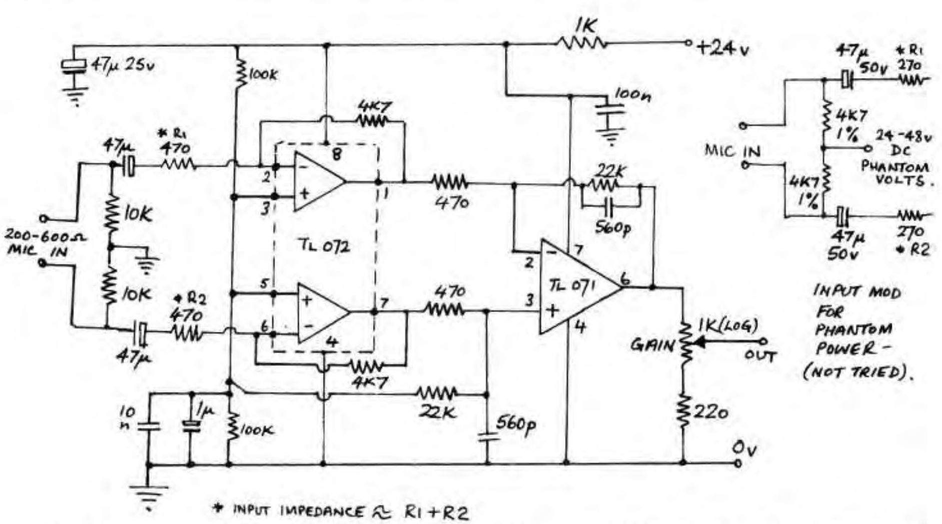
$$\text{Turns ratio} = 10{:}1$$

FIG 8. MIC AMP WITH BALANCING TRANSFORMER



It's important to know the turns ratio, as the voltage step-up will contribute to the overall voltage-gain of the module. The amplifier itself is connected in the non-inverting mode, its input impedance being defined by the two 100K biassing resistors in parallel. The amplifier gain can be varied from 5 to 23, which, in combination with the transformer step-up, gives a voltage gain of 50 to 230. A further gain of about 10 is required to reach line level, and this would be supplied by the subsequent line amp in a sound desk.

FIG 9 - TRANSFORMERLESS BALANCED MIC AMP (EXPERIMENTAL)



The trouble with microphone transformers is their cost, as it is quite difficult to make a well-screened unit with a good frequency response for handling low level signals. The one specified above costs approximately £15, and so if several channels are required this can get pretty expensive. An alternative, but one that I have only 'breadboarded', and have not used 'in service', is to use a differential input amplifier. For those of you that might like to experiment, I offer Fig.9, but remember that it IS experimental, so don't write to me if it isn't good enough. (On the other hand, if it works brilliantly you may write to congratulate me!). The input circuit consists of a dual op-amp (TL-072) arranged to present about 1K to the mic. This is higher than the nominal impedance, but as dynamic mics are inductive

their impedance tends to rise at high frequencies. By choosing a figure slightly higher than nominal the upper end of the frequency response is maintained without causing too much of a mismatch. (This problem does not occur when using a transformer, as this, like the mic, is inductive). Having matched to the mic with the TL072, a TL071 is arranged as a differential amplifier to balance out any interference, thus serving the same purpose as an input transformer. The inset drawing shows how phantom powering may be added, using resistors matched to 1%. Note the change in polarity of the input capacitors. The gain is adjustable up to about 450.

FIG 10: - UNBALANCED INPUT MIC-AMP

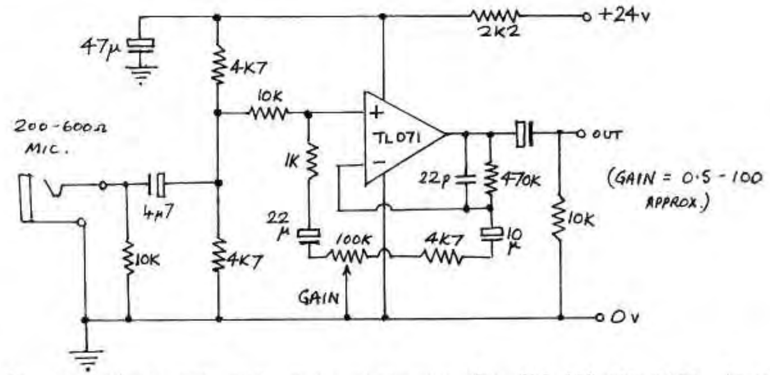


Fig.10 is an unbalanced mic amp, once more for 200-600 ohm mics. As with fig.9, because the input is resistive, a figure of about 1.8K is presented to the mic to maintain the HF end of the response. The arrangement of the TL071 here is interesting, as it is a variation on the non-inverting mode, this being combined with an input attenuator. In this way the gain can be varied on a single control from about 0.5 t0 100. This means that used in a mixer, this channel could handle signals from mic level right up to about -20dB (say 75mV). For amateur use, this is probably the most useful of the mic circuits I have shown, although as in fig. 8, a further 20dB of gain (x10) is required to reach line-level.

FIG 11 :- PRINCIPLE OF BAXANDALE-TYPE TONE CONTROL

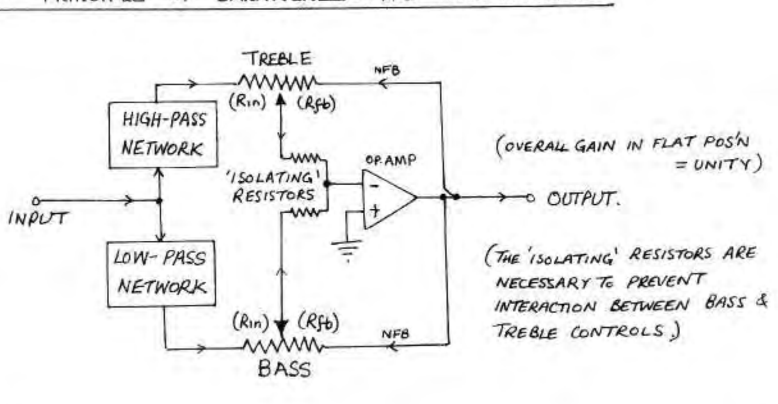
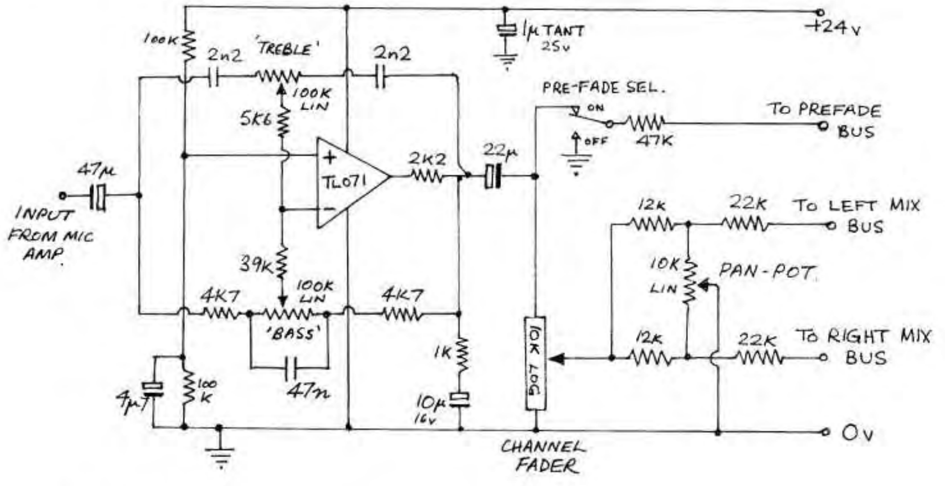


FIG 12 :- TONE CONTROL AND CHANNEL OUTPUT NETWORK



TONE CONTROL AND MIX AMPLIFIERS

Nowadays it is normal to have some form of equalisation in each channel of a sound mixer. The most widely used circuit is that based on a circuit designed in the distant past by Peter Baxandale, using frequency selective negative feedback to give treble and bass boost and cut. The circuit is readily adapted to the inverting op-amp. The principle is illustrated in fig.11. The signal is split into HF and LF components, and then applied to an inverting amplifier. With the bass and treble controls centered, Rin=Rfb, and the response is flat. Moving the sliders from the centre position applies either cut or boost to the HF or LF signals, as the relationship between Rin and Rfb changes.

FIG 13 :- MIX AMPLIFIERS

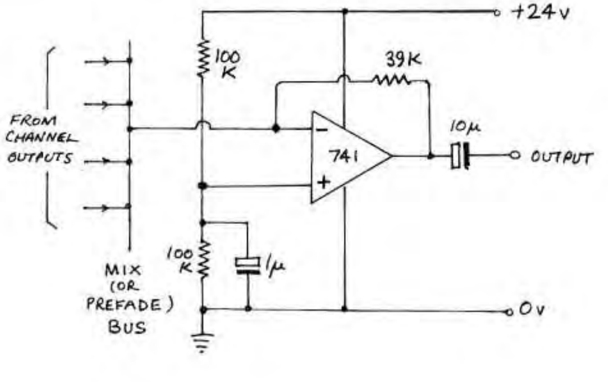
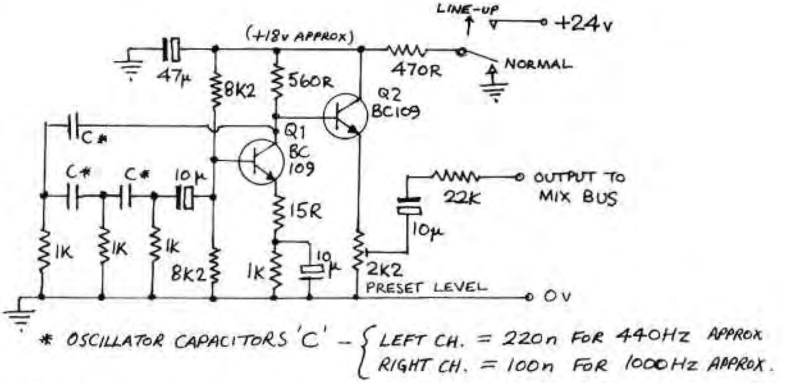


Fig.12 is a practical circuit for tone controls, together with a channel output network consisting of fader, prefade selection, and pan-pot. This last mentioned is only used in a stereo mixer, and allows a mono source to be "panned" into the left and right output chains of the mixer as required. If centered, the output is divided equally between left and right, and so the source appears at the centre of the stereo image. By adjusting the pan-pot, the source may therefore be "placed" anywhere from left to right in the sound stage.

There are three outputs from the circuit in fig.12 - the left and right outputs from the pan pot, and the pre-fade output for monitoring before the fader. Each is fed out via a series resistor which will form the "Rin" of a virtual-earth mixing amplifier. In multi-channel mixers, it is usual to speak of these virtual earth collecting rails as "busses" - Thus we have the "left mix bus", the "right mix bus", and the "prefade bus", each with its own mix amplifier. The mix amplifiers are the basic inverting op-amp configuration, and this is shown in fig.13.

Fig. 14 is a circuit for a line-up oscillator that can inject tone into the mix-busses. In a stereo mixer it is best to have two oscillators of different frequencies so that if tone is injected into both left and right chains simultaneously they do not add in phase, causing any derived mono outputs to indicate +6dB. The circuit itself is an RC phase-shift oscillator, oscillation being maintained by the inverted output from the collector of Q1 being shifted into phase at the base by 3 RC couplings that each give 120 degrees shift at the chosen frequency. The output preset is adjusted so that with the master faders at their nominal setting, the tone reads line-up level at the output of the mixer.

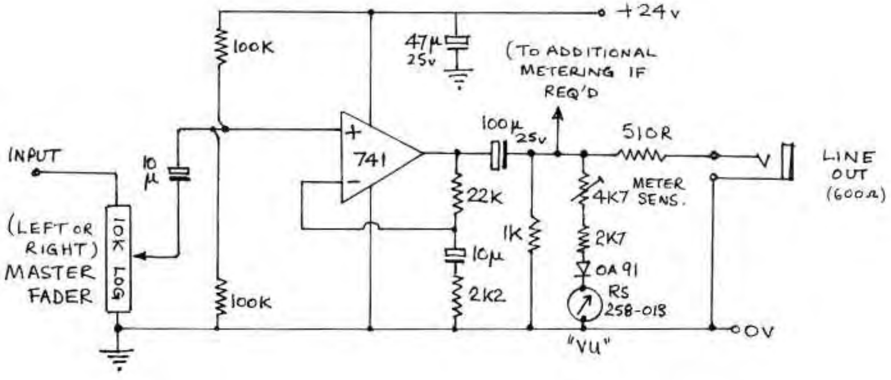
FIG 14:— LINE-UP OSCILLATORS



LINE AMPLIFIERS AND MONITORING

A line amplifier with a gain of 10 is shown in fig.15, following the master fader control. A build-up resistor to give an output impedance of about 600-ohms is included; however, if it is preferred this may be omitted, and then the output impedance will be about 70-ohms. If the mixer is to feed several destinations simultaneously, a low output impedance will probably be better.

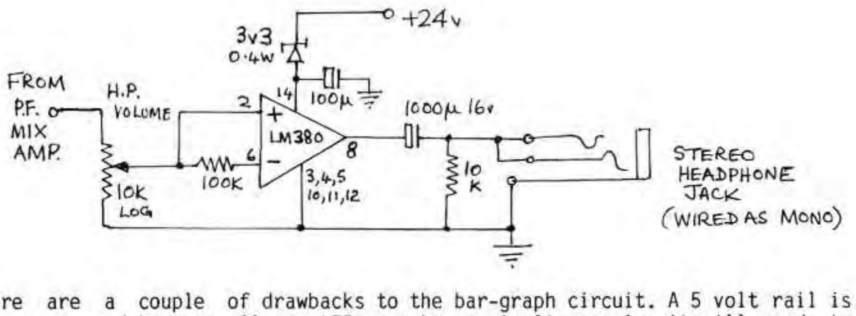
FIG 15 :- LINE AMPLIFIERS



In figure 15 I have shown a low-cost level metering arrangement, using the RS 258-013 "VU Mini-Meter" (available through Electromail, about £3). I havn't used this particular meter before, but it should be satisfactory in this simple circuit. As a matter of interest, RS can in fact supply a true VU meter that can be connected directly accross the 600-ohm output, but as the cost of these is about £15 each, it's a bit pricey. Professional PPMs are even worse, a meter and drive amp. being £63 plus VAT - so let's keep our feet on the ground!

If a better level-monitoring system is required, fig.16 shows an LED bar-graph indicator. By using the 3915 driver IC, we can get a linear dB scale - in the circuit shown each LED indicates a 3dB step. In order to keep the cost down, I have shown the circuit as a L+R peak indicator so that only a single circuit is required. By incorporating simple switching at the input, it would be easily possible to make the meter selectable to L, R or L+R.

FIG 17. HEADPHONE AMP. (PREFADE MONITORING)



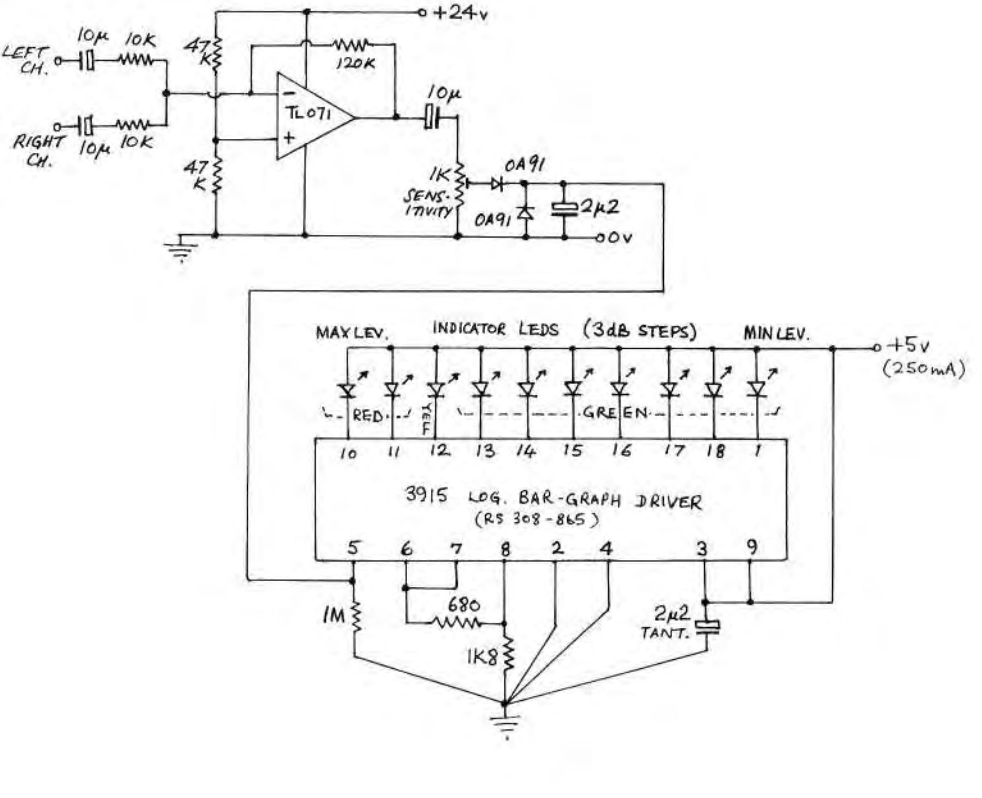
There are a couple of drawbacks to the bar-graph circuit. A 5 volt rail is necessary, and because all ten LEDs can be on simultaneously, it will need to be able to supply up to about 250mA. It is also important to lay out the

circuit so that the length of the leads from the 3915 to the LEDs do not exceed 150mm, or oscillation causing false indications can occur. For the same reason single-point earthing is recommended, as shown on the circuit diagram. Nevertheless, this circuit does give a very accurate level indication, and I have used it for last 6 years without any problems.

Finally, in fig.17 there is a headphone driving amplifier for prefade monitoring. The circuit uses an LM380 2W amplifier that should be adequate for driving 8-ohm stereo headphones, although of course only a mono prefading signal is available. The zener diode in the supply feed is necessary as the maximum supply allowed for the LM380 is 22volts.

I have not yet covered items such as filters, equalisers, compressors, noise gates, echo, etc., all rather specialised sound techniques. If there is interest, perhaps these can be covered in a later article.

FIG 16. L+R LOGARITHMIC BAR-GRAPH LEVEL METER



WHAT DOES WHAT?
part-2

We continue our potted guide to the items currently available from the BATC members services. As a reminder, most of the club's printed circuit boards are 112mm x 176mm (ISEP size). Some, however, have been laid out so that they can be trimmed to Eurocard size (100mm x 160mm), if desired. Board sizes are given below only for non-ISEP size cards. Although many are designed to use the ISEP 33-way edge connector, the less expensive 32-way connectors can also be used.

The PAL COLOUR CODER first appeared in the 'Amateur Television Handbook', and was reprinted in 'Micro and Television Projects'. The circuitry is largely based on BC184/BC214's, the modulators being made by using a TV receiver demodulator, TBA520, in reverse. The board requires 0.7V red, green and blue signals, (either analogue or digital), a 1V 4.433MHz colour subcarrier, and standard, 2V, level mixed sync, burst gate and PAL switch pulse inputs. The output is a 1V p-p composite PAL signal. Filtering is fairly simple, so the output is not to broadcast standards, (having full bandwidth chroma signals) but quite acceptable for amateur use. For reasonable stability, a well regulated 12V supply is needed. The original article gives setting up instructions, without needing a vectorscope.

An alternative way to produce encoded colour signals is the CHARACTER COLOURIZER. This is based on the LM1886 and LM1889 ICs. It can generate its own colour subcarrier, or this signal can be fed from a sync pulse generator. The board also needs mixed sync, mixed blanking, burst gate and PAL switch pulses. The board also includes a colour bar generator, and an interface so that the background and text from a character generator can both be coloured. The vision inputs should all be at TTL logic levels. The component locations are silk screened onto the board.

In 'TV for Amateurs', CQTV 122, and various other issues, appears a very useful VIDEO FILTER circuit. This uses pre-aligned Toko filters (available from Bonex Ltd) to limit the bandwidth of the signal, and is essential if the video is generated by computer logic or similar circuits, particularly if the output is to be fed to a transmitter. The board measures just 68mm x 32mm.

The HORIZONTAL APERTURE CORRECTOR board accomodates two identical corrector circuits, and also has space for an ASTEC R.F. modulator. The horizontal aperture corrector sharpens up black to white (or reverse) transitions, to correct for poor definition in the camera. It uses a length of co-ax cable as a delay line, and discrete transistor circuitry, which appears in the 'Amateur Television Handbook'.

CQ-TV130 contains details of a VISION PROCESSING AMPLIFIER. This board accepts a colour vision source and inserts clean sync pulses and colour burst. It requires a line clamp pulse, mixed blanking and a 'black and burst' input as well as the video to be

processed. The circuit is ideal for tidying up the signal after passing through a mixer. This board can be trimmed to Eurocard size. The output stage is capable of driving several loads, although there is only an impedance matching resistor for one load on-board.

The VISION SWITCHER MATRIX, VISION SWITCHER LOGIC, VISION MIXER, AND WIPE EFFECT GENERATOR boards are designed to work together - the selection of boards depending on the complexity of the system being built. All the controls can be mounted remotely from the signal processing circuits, which are suitable for handling colour signals. The details of all four boards appear in 'Amateur Television Handbook Vol-2 Revised'.

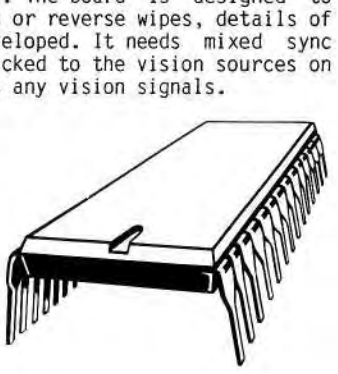
The SWITCHER MATRIX card contains eight vision switching points, any one of which can feed the on-board four output video distribution amplifier. The input is selected by four TTL control lines, and cuts take place during the vertical blanking period, for which the board needs a field drive pulse. The board returns, via three TTL lines, an indication to the control panel as to the input selected.

The VISION SWITCHER logic card is 140mm x 153mm. It contains the TTL circuits to select the inputs to two vision switcher cards, and decode the indicator lines from those boards. The layout will accept the push button switches with integral LEDs directly, although other swiches and indicators can be wired to the board. The circuitry relating to each switcher card is separate, so the card can be cut in half if desired.

The VISION MIXER accepts two vision sources and a key input. It is essential that these, and mixed syncs needed to generate the clamp pulses, are all genlocked together. The key input determines what proportion of either input is at the output at any point on the screen, so the board is capable of wipes or fades. The power supply needs to be as well regulated and free from temperature drift as possible.

The WIPE EFFECT GENERATOR comes with a set of notes and ideas on adjustment etc. and details of additions to the published circuit to enable remote control of the effects. The present board enables horizontal and vertical barndoors, horizontal, vertical, diagonal, diamond, circle and other wipes, and cross fades to be created on the vision mixer. The board is designed to accept an add-on board to create multiple, gated or reverse wipes, details of which will be given in CQ-TV when it has been developed. It needs mixed sync and mixed blanking pulses, which must be genlocked to the vision sources on the mixer card. This card does not itself process any vision signals.

The 4 WAY VISION SWITCH from 'Micro and Television Projects' is a much simpler system, and so does not have the refinements for colour or inter-field cuts in the system described above. The board is 78mm x 130mm and does not need pulses from an SPG, or genlocked sources.



The 'SPECTRUM' USER PORT is 90mm x 82mm. It contains the buffers and latches to connect to an on-board edge connector for directly fitting to the Spectrum computer. The circuit details

are in 'Micro and Television Projects', which also has ideas for detecting and switching video as, for example, in a TV repeater.

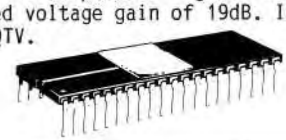
The SPECTRUM PROM BLOWER, also from Micro and Television Projects, enables 2716 or 2732 type EPROMs to be programmed under the control of a Spectrum. This circuit connects to the Spectrum rear edge connector through a separate plug. The board measures 75mm x 113mm.

The TELETRON project was described in 'Micro and Television Projects'. Teletron is a small television orientated micro computer, with 2k RAM, and the program in an EPROM of the 2716 - 27128 family. The C.P.U. used is a Z80. The board has 24 input/output lines, allowing many peripheral devices to be interfaced. The board can be trimmed to Eurocard size.

The REVISED TELETRON VDU circuit appeared in CQTV 132. It enables the Teletron display to be locked to and superimposed on another video source. There can be 8 lines of text, each containing 16 characters. This card can also be trimmed to Eurocard size.

Information on using the Teletron project as a television typewriter appeared in CQTVs 133 and 134. A 2716 E-PROM called TRON-1 with the program for this is available from BATC. Teletron is widely used for controlling ATV repeaters and a good deal of applications and software information is now available through CQ-TV or by contacting Trevor Brown G8CJS.

The MC1445N GATED VIDEO AMPLIFIER IC has two differential video inputs, and a differential output. The input can be selected by a TTL compatible signal. The amplifier has a bandwidth of 50MHz and a single ended voltage gain of 19dB. It is used in several circuits that have appeared in CQTV.



In the third, and final part, we shall provide details of the boards for RF and SSTV use.

IN RETROSPECT

COLOUR TESTCARD CALLSIGN GENERATOR - CQ-TV 118

Richard Carden - VK2XRL - has done a couple of mod's to this callsign generator which some of you may be interested in.

The original circuit used a 74188A programmable ROM but Richard has replaced this with a 2716 EPROM, making the programming somewhat easier and, of course, allowing the same chip to be modified in the future. A BCD thumbwheel switch allows for page selection.

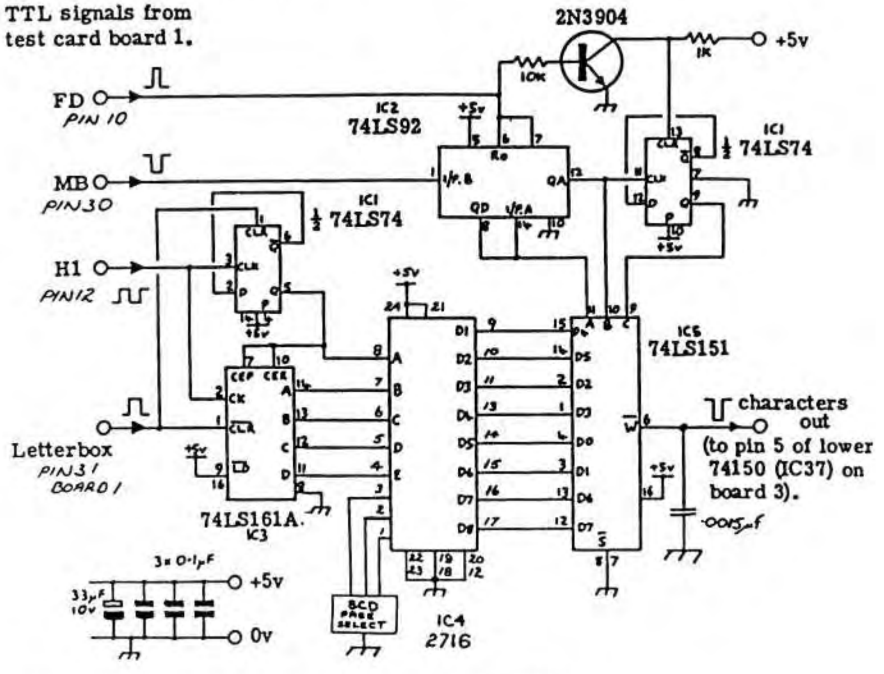


Fig.1 Original callsign generator (modified)

The addition of a simple timer circuit (Fig.2) allows two pages of information within the EPROM to be displayed alternately, the rate depends on the 555's timing components. Adjustment can be made by changing the value of the 10k 'A.O.T.' resistor.

One other problem which Richard experienced was that some extra (unwanted) information was being produced by IC5, this seems to be caused by inaccuracies in some of the timing circuitry. However, a 1.5n capacitor from pin-6 to ground has cleared the problem.

COLOUR SPG - 'REVISED ATV HANDBOOK'

Bryan Dandy - G4YPB - makes the following observations on this circuit;

The unit derives the PS signal from a D-type flip-flop, driven from line drive. PS should toggle at the leading edge of line drive and as the 7474 used is POSITIVE edge triggered, an inverter should be used in the line between LD and the 7474. IC9 has two spare gates, one of which would be ideal as an inverter.

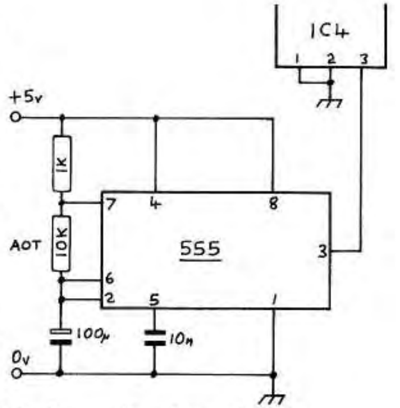


Fig.2 New timer circuit

SSTV TUNING INDICATOR - CQ-TV 140

J.Cronk - GW3MEO has some interesting points to raise on this item and, indeed, on the general use of the NE567 PLL chip. Probably the best way of presenting this is to quote from his actual letter:

'At first sight this seemed an ideal application for the NE567 PLL chip, and apart from increasing the value of C3 to 0.3uF to bring the centre frequency down to 1200Hz, it worked well on a tone generator. But it refused to operate on the SSTV line sync pulses. On referring to the Signetics Handbook (p279) the capacitor on pin-2 is most likely to affect the bandwidth (not pin-1). Both the capacitors are part of filter networks to eliminate spurious responses and slow down settling time. For highest operating speed at 1200Hz, pin-2 capacitor should be 0.1uF and pin-2 should be 0.2uF, said to be non-critical. However, the crunch comes; I quote; "the minimum rate at which digital information may be detected without information loss or chatter is about ten cycles per bit", as a 5mS line sync pulse will only have about 6-cycles and the only way to be sure it is the line sync pulse lighting the LED is by the 15Hz flicker, it seems this circuit will not meet the requirements of a sync indicator.

The response time can be improved by lowering the voltage on pin-1 by connecting a resistor to ground (page 287), also the bandwidth is said to be constant on signal levels above 200mV. Even after some experiments with Cs and Rs I was not able to get the circuit to respond to SSTV line syncs, but it was OK with the frame.

I would also mention that the NE567 is available in both 14-pin DIL (NE567F) and 8-pin DIL (NE567V) packages. The pin connections shown in the article are for the 8-pin version and are of course different for the 14-pin.'

LET'S BUILD A REPEATER - CQ-TV 139

A couple of points arising here:

A printed circuit board for the 6MHz intercarrier sound generator (p53) is now available from Members Services (see supplement for ordering details). The board measures 45 x 135mm, is single sided and comes with component layout diagram.

Page 55 referred to a crystal local oscillator module from the RSGB. I understand that there may be a tendancy in some units for spurious oscillations to occur, and that by grounding the crystal can this problem should be eliminated.

AN A/V FADER - CQ-TV 140

Nothing wrong with the actual article but the PC boards have one or two gremlins;

On the 'main Board' Q7 base should connect to Q6 and R20, Q6 needs to be the other way round to that shown on the layout diagram accompanying the board. The link immediately above R8 is not required and should not be fitted.

The following decoupling components are not included on the board but may be easily fitted to the print side; C13, C16, C18.

This information is included on current documentation sent with the boards.

TV REPEATERS...an overseas list - CQ-TV140

Member Paul Veldkamp, PA0SON, ATV-Repeater Manager for VERON has notified a small error in the repeater list on page 38. The last entry on the page should read PI6EHV 434.25MHz AM in, 1285MHz FM out. Paul also notifies a new Dutch repeater; PI6ATV 2359MHz FM in, 1285MHz FM out JO22OF.

NEED A CIRCUIT?

The 'Mauritron Review' - ever heard of it? One member has so he sent me a copy to have a look at (thanks). It looks, on the face of it, as though it COULD be quite useful to many of you so here's what it's all about:

Mauritron Review is 'a unique publication which caters primarily for anyone who ever uses, repairs or sells any electronic/electrical equipment. Designed for its contents to be continually updated and expanded, this review is only available from: Mauritron Technical Services, 8 Cherry Tree Road, Chinnor, Oxfordshire OX9 4QY. The contact is Maurice Small G0HJC.

The publication has about a dozen pages in which can be found such things as free member's small ad's, servicing data information, technical society information, various publications and guides, data books, contact information, component bargains and many other interesting items.

It seems that initially one joins the 'Mauritron Technical Society' for a once-and-for-all payment of £10 and then pays just £5 (currently) per year to sustain that membership. For your money you get a years subscription to the Mauritron Review, free small advertising, some free technical advice, access to trade names and addresses with a particular emphasis on the provision of documentary information. There is a wealth of service manual and circuit information available on everything from the earliest military surplus sets to the latest Japanese black boxes, this includes amateur radio gear, televisions, Hi-Fi, tape recorders, videos, car radios, communications equipment, test equipment etc. etc.

IN PLACE OF THE TUBE

Part-1

By Peter delaney G8KZG

In the recent series "In Front of the Tube" in CQ-TV we considered, amongst other things, the various optical items that can be placed in front of the television camera tube. With modern technology, however, it is possible to convert the light to a video signal without using a camera tube at all.

Of course, there have long been other ways to do this. The Nipkow disc and the mirror drum were both used by John Logie Baird before the first camera tubes were developed. Such methods are still used for some specialised thermal imaging cameras, and are also in amateur use by members of the Narrow Band TV Association. (Ref 1.)

Most of the alternative methods of picture generation tend to be of comparable size to a conventionally tubed camera. The 'modern technology' referred to, however, enables a complete monochrome camera to be built in a case 50mm square and 95mm long, requiring just a 12V power supply. Such cameras do not suffer from 'burn-in', lag or scan distortion inherent in the tubed camera. The magical component that achieves this is a Charge Coupled Device, or CCD for short.

The CCD is a MOS type silicon integrated circuit, in a DIL package. A typical device, the EEV P8602, is shown in Fig.1. On the top is a window, covering the image section of the device, corresponding to the target in a vidicon. CCD's can be either linear array devices that sample a line of the picture, or area array devices, that sample the complete frame of the picture. The linear array device is used in some broadcast type telecine machines, where the movement of the film creates the effect of the vertical scan. In a camera, of course, an area array is required.

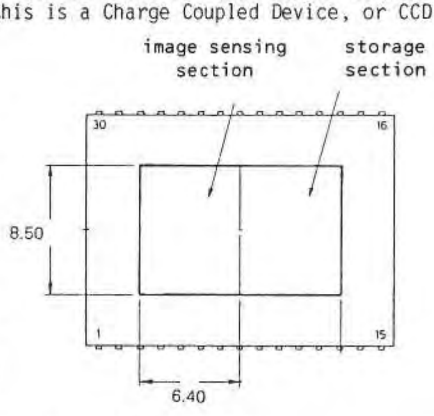


Fig.1 Typical CCD

There are three basic types of CCD - the frame transfer type (as made by the European manufacturers EEV, Thomson CSF and Mullard/Philips), the X-Y photo-sensor array (as made by the Japanese, such as Hitachi), and the interline transfer type (as made by Sony and Fairchild). The frame transfer type will be considered first, taking the EEV device mentioned above as an example.

The silicon substrate is covered with an oxide layer, on which is an array of electrodes, each of which is like the gate of a MOS transistor. A quantity of electric charge represents the signal information, and collects under the electrodes with a suitable voltage on them. For most devices this is positive, as the charge carriers are electrons. The charge representing the signal can be moved from one electrode to the next by the process of 'charge-coupling'.

The second electrode is taken 'high', and the first then taken 'low' to move the signal charge with negligible loss or added noise. In practice the electrodes are so arranged that they can be driven sequentially by a 3-phase set of pulses. (Fig 2). The charge is stored under every third electrode, and moved by the externally generated pulse train.

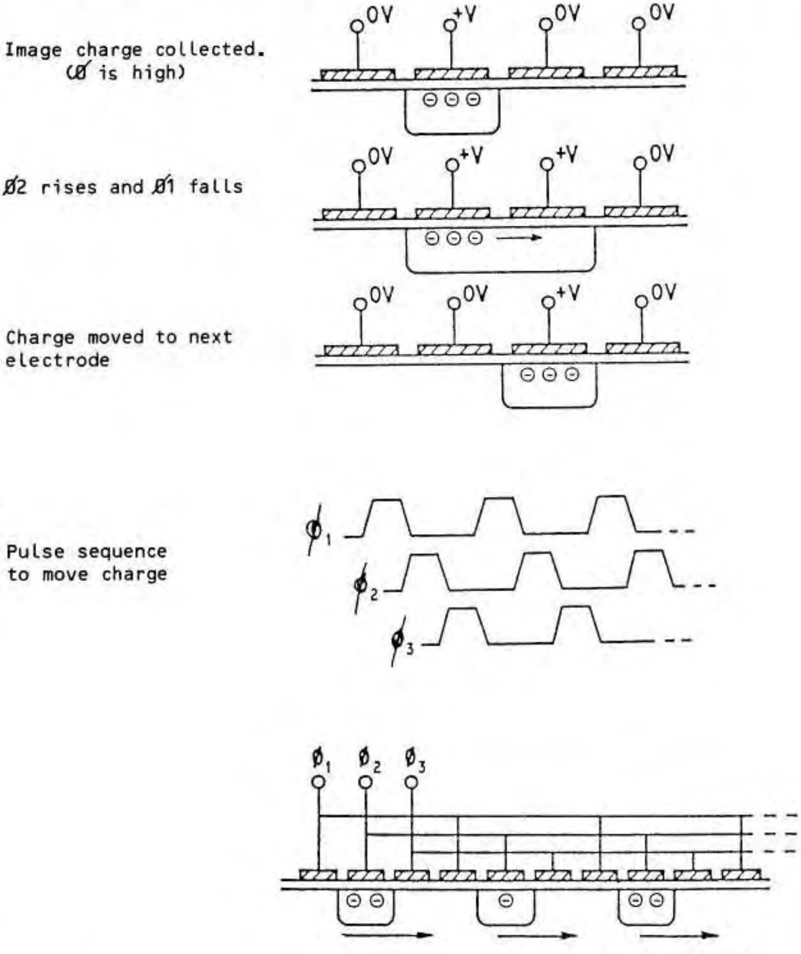


Fig.2 Basic charge-coupling sequence

The CCD contains several similar sections. (Fig 3) The image section is behind the 'window'. When light falls on this, the light energy produces electron-hole pairs, and the electrons collect under the positively biased electrodes, as described above. The charge is directly related to the light intensity, and the time it is allowed to collect (called the integration

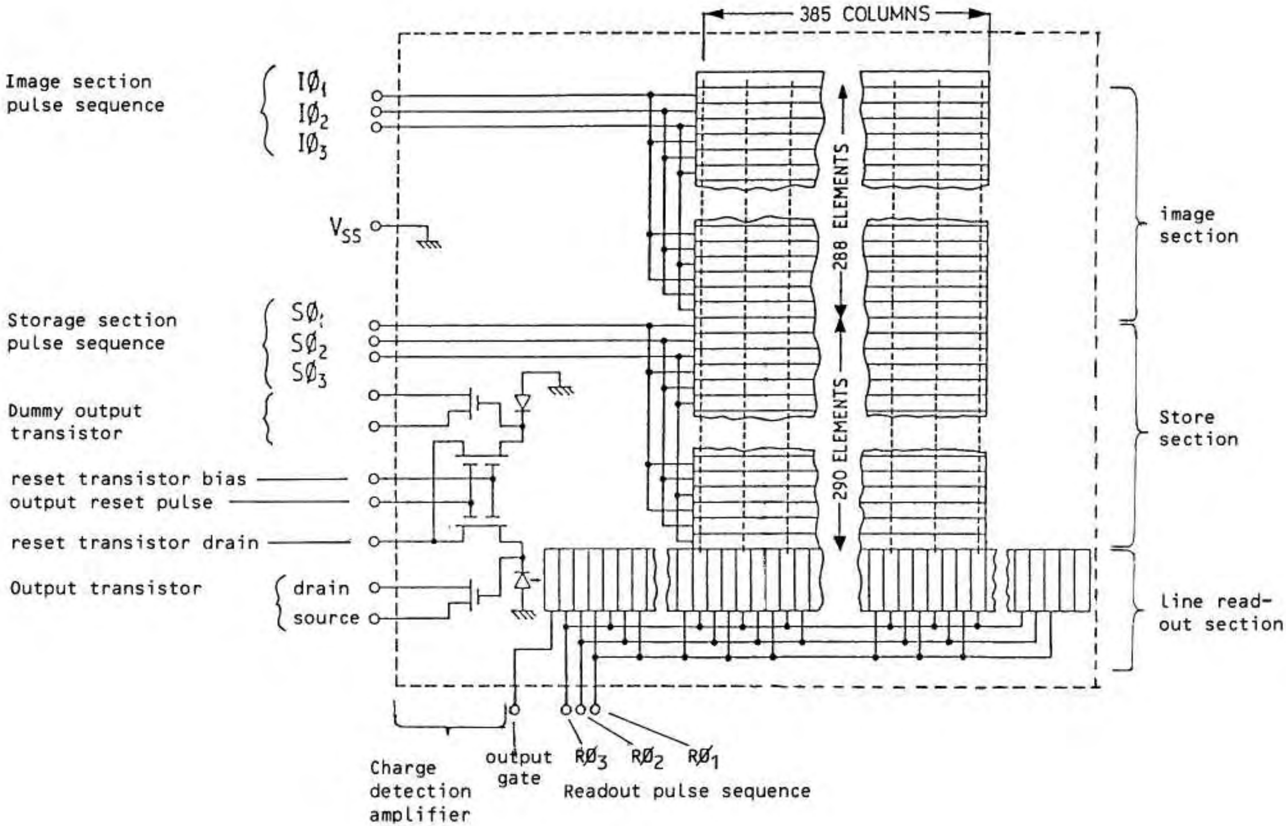


Fig.3 Simplified diagram of CCD internal structure

time). At the end of this period, the charges are moved to the storage section of the CCD. This is done as quickly as possible, as otherwise the light still falling on the image section could generate errors in the transferred data (a frame shift smear). The complete frame of the picture is now represented by the stored charges in the storage section, which is masked from the light, of course. The next step is to transfer the charges, a line at a time, to the line read out section. The charges are moved in sequence, in the same way as before, to an output stage that converts the charge to a varying voltage output. In this way the complete frame is converted to a voltage that corresponds to the incident light level at each point in the image. The next frame of charges, which have been building up in the image section during this readout process, can then be transferred to the storage section, and the pattern repeated.

Usually, the scanning of a camera tube is done so that each frame is made of two interlaced fields. This effect is achieved in a different way with the CCD. As stated earlier, the charge is stored under every third electrode in the array. To generate two fields, the electrode corresponding to a different phase of the image read signals is used as the centre of charge collection on each field. The charge is collected from the whole image area for every field, but as the centres of charge collection are moved vertically, the effect is a 2:1 interlace. Each field is composed of 288 lines, each of 385 pixels, which gives a 576 line frame. This is equivalent to the 625 line system. The usual circuit configuration has an integration time equal to the field time and uses the vertical blanking time to move the charge pattern from the image section to the storage section. The circuitry to achieve all this replaces the scan coils and their drive circuits in a tubed camera. There is no need for a focus coil, of course, as there is no electron beam to be focussed!

The image area on the P8602 CCD is 8.5mm x 6.4mm. This means that each sensor element is just 22 micro-metres square. This image area is about the same as that for a 2/3" vidicon, enabling standard lenses to be used for focussing the picture onto the CCD surface.

In this article, of course, only an outline summary can be given of the way the CCD works. A more mathematical discussion on the characteristics of charge coupled devices has been written in a book produced by the English Electric Valve Co. (Ref 2).

In part-2 we will look at the pulse patterns and circuits needed to operate the CCD.

Ref 1. NBTV Association, c/o Doug Pitt, 1 Burnwood Drive, Wollaton, Nottingham.
Ref 2. 'CCD Imaging' written by EEV, Waterhouse Lane, Chelmsford, Esssex.

A POWER DIVIDER/COMBINER

By S.Jewell G4DDK

This article first appeared in the July 87 edition of the 'Microwave Newsletter' and we extend our thanks to the editors and RSGB for permission to reproduce it here.

THE WILKINSON DIVIDER

Wherever it is necessary to combine or divide signals from two or more in-phase sources, the Wilkinson combiner/divider is invariably used (Fig.1). The Wilkinson is justifiably popular for this purpose, but it does have one serious practical disadvantage; this is the requirement that the series resistor be balanced with respect to ground. Under normal conditions the resistor dissipates little power and therefore does not require special attention to heatsinking. However, under fault conditions, dissipation in the resistor can become significant, especially when the unit is used to split and combine power from power amplifiers. A balanced load resistor is not easily provided with heatsinking. In addition to the heatsinking difficulties the resistor is 100-ohms for a two-way division, and suitable resistors of this value can be difficult to find, particularly for the higher frequencies. With the above problems in mind members may be interested to know of an alternative arrangement of power combiner/divider that largely overcomes the problems with the Wilkinson.

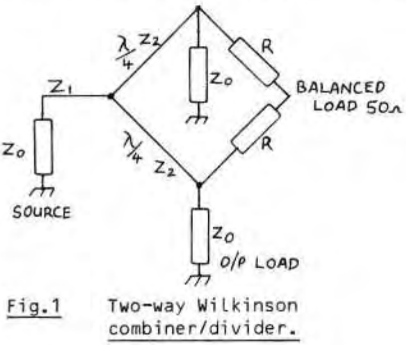


Fig.1 Two-way Wilkinson combiner/divider.

AN ALTERNATIVE

An article in the 'Microwave Journal', January 1979, by Harlan Jones Jr. reviewd an earlier paper by Ulrich Gysel (note 1), describing a simplified design of a high power N-way in-phase power divider/combiner. The writer of the original paper had experienced the problems with the classic Wilkinson unit and had developed an alternative circuit (Fig.2). Many permutations of suitable load resistors and transmission line impedances can be used, but when certain restrictions are placed on the circuit implimentation, a simplified design results. It is convenient to use a transmission line of 50-ohms between the source and the splitter (Z1). The load resistors (R) are conveniently 50-ohms also. When this is the case, Z2 becomes:

$$Z2 = \sqrt{N} \times Z0$$

where: Z0 = 50-ohms
N = Number of ways signal is split.
Z2 = Impedance of 1/4 wave matching line.

For a two-way split in 50-ohms, Z2 = 70.7-ohms.

Similarly, the impedance of Z4; the star interconnection, is given by:

$$Z4 = \frac{Z0}{\sqrt{N}}$$

For a two-way split in 50-ohms, Z4 = 35.4-ohms.

Z1 can be any convenient length. Z2 should be a 1/4 wave at the midband frequency of the unit's operating range. In a two-way unit, Z4 should be a 1/2 wave between the two load resistors. Z3 can be any convenient length of line at the same impedance as the source Z0.

Using this alternative power divider/combiner design the load resistors are each 50-ohms. Coaxial terminations of this value are relatively easy to find on the surplus stands at many rallys. Alternatively, a high power 50-ohm PCB tab-terminated load resistor is available from the RSGB microwave component service, (CBT-40) suitable for use up to 4GHz.

CONSTRUCTION

Printed circuit construction of the combiner/divider is straightforward, since no crossovers or other difficult transitions are required. Printed circuit mounting sockets can be used to connect the load resistors into circuit. These are easily accommodated on the ground-plane side of the board on which the unit is etched. If coaxial construction is preferred, the 70-ohm line should not be too difficult to achieve, 75-ohm cable probably being acceptable for most purposes, especially since 52-ohm cable may be used for the input connection! 35-ohm cable is available (RG83-U) although rare. It should be possible to use two parallel 1/4 wave lengths of 70-ohm as a substitute.

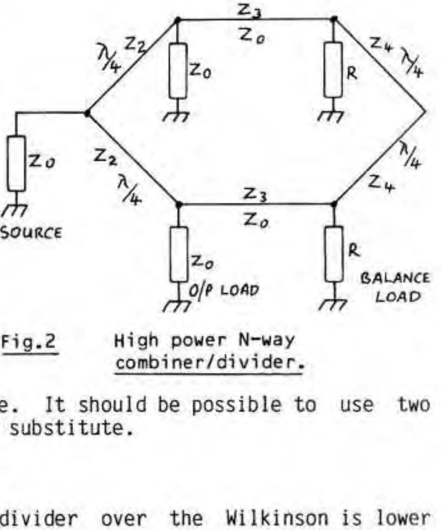


Fig.2 High power N-way combiner/divider.

PERFORMANCE

One disadvantage of this power divider over the Wilkinson is lower bandwidth. This should not be too much of a problem when used within an amateur band, and is claimed to be around 20 to 30 percent anyway. Isolation between the two outputs (inputs) should be better than 30dB at design centre frequency, degrading to around 20dB at +/-20% of centre. VSWR should be better than 1.2:1 at centre frequency.

With the increase in interest in combining several amplifiers to reach higher power, especially with the availability of transistor power modules, combiners and dividers of this type can be very useful. If attempts are made to combine two amplifiers it is most important to ensure good isolation between the amplifier outputs if good intermodulation performance is to be achieved. Just remember the problems in combining the outputs from two signal generators when performing intermodulation tests on receivers. Interaction between amplifier outputs can be severe.

The worst-case conditions probably occur with valve amplifiers when they are warming-up and the tuning is still drifting. A classic Wilkinson combiner will have large dissipation in the balance resistor under these conditions. Where combiners are used that have no balance resistor, poor intermodulation performance is sure to occur.

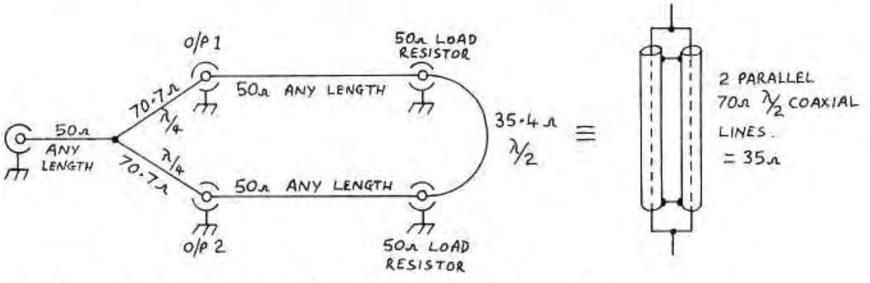


Fig.3 Two-way 50-ohm high power combiner/divider.

Semiconductor power amplifier modules such as those by Mitsubishi can be used across the whole of 23cm without re-tuning. These modules are therefore attractive as medium power alternatives to the ubiquitous 2C39. Combining a pair (or more) is likely to be very popular. Using a power combiner is the most obvious way of achieving this, but it does mean that dissipation in the balance resistor will vary with frequency. At the band edges (ATV operation) the dissipation can be very significant compared with operation at (say) 1296MHz, if the combiner is optimised for this frequency. This alternative combiner can use low-cost load resistors - such as those sold by Electromail - rated at 0.5W. If these prove inadequate, then it is possible to resort to higher dissipation loads or the good old amateur standby - half a mile of RG174 and a half-Watt load - twice! Try doing that with the classic Wilkinson and maintaining the load resistor balance.

Note 1: MTT-S Symposium Digest 1975. A new N-Way Divider/Combiner Suitable for High Power Applications. Ulrich Gysel.

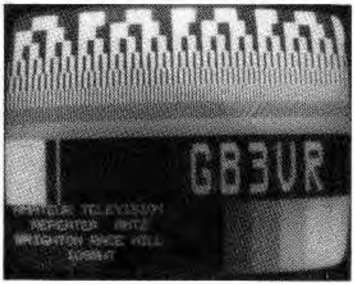
COLOUR ON THE ELECTRON

By Jim Bramhill, G2BMI

The composite video output from the Electron computer is normally in monochrome, however, checking in the 'Advanced User's Guide', on page 234/235, link-four is shown not connected. Tracing this point back shows it to go straight to the colour-burst IC, connect this link and 'Voila' - colour pictures are available at the composite output.

Link four is very short and is located around the middle of the main board near to Q7 and C17 - it is labelled. You will probably need a magnifying glass and a very small soldering iron in order to make this link - good luck!

THE WORTHING AND DISTRICT VIDEO REPEATER GROUP



EBU TYPE 1

CONTEST NO.

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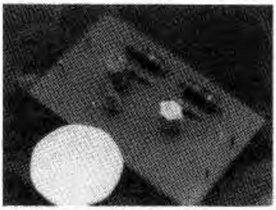

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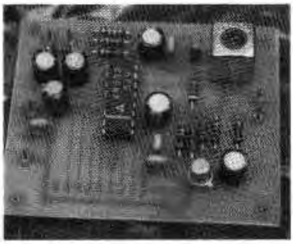

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